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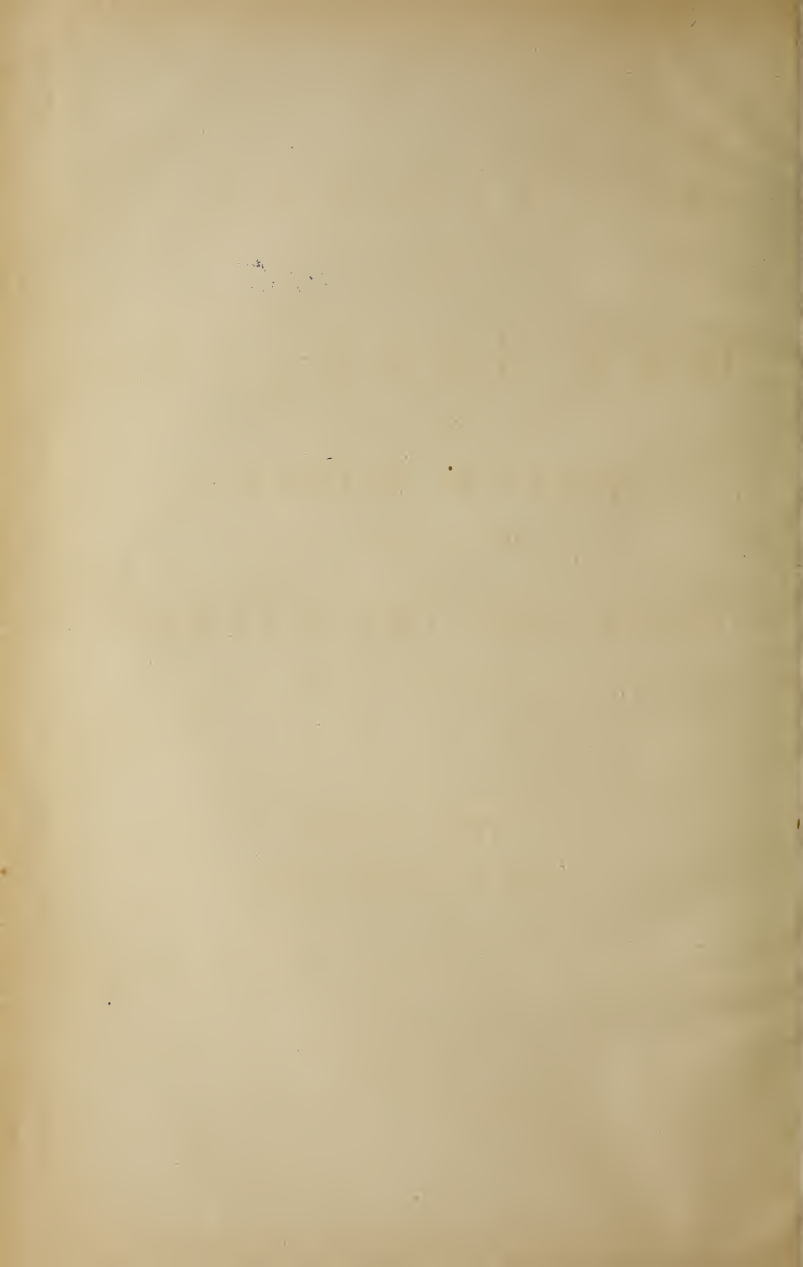
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TO CORRESPONDENTS.

A COUNTRY MANAGER.—*The manufacturer is acting quite legally. There is no Act of Parliament under which you can take proceedings against him, unless he opens a road or street to lay pipes. Then he can be indicted for nuisance at common law.*

W. L.—*Shall be glad to know what led to the writing of the letter you sent last week. A simple denial of the correctness of a statement published, so long ago, is hardly satisfactory, without some explanation.*

F. W. HARTLEY; LEWIS T. WRIGHT.—*Owing to pressure on our space to-day, your letters were obliged, at the last minute, to be held over till next week.*

TO SUBSCRIBERS.

An Index and Title-Page to the First Half-Yearly Volume of the JOURNAL for 1880 are furnished with this number, and cloth cases for binding may be obtained on order from any bookseller, or from the office; price 2s. 6d. each.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 6, 1880.

Circular to Gas Companies.

THE CASE of *Johnson and others v. The Gaslight and Coke Company*, a full report of which appeared in a recent issue of the JOURNAL, has done something towards determining a point on which there has hitherto been much division of opinion. The facts of the case were simple, and upon those of importance there was little conflict of testimony. The Gas Company, fourteen years ago, laid a main-pipe along a road where they had been called upon to supply gas. At that time it is proved that the road was in good condition for receiving the pipes, the earth being in its maiden state, sound and unbroken. Two years later a main sewer was carried through the road, and the houses connected with it by branch drains in the ordinary way. It was stated by the prosecution, but not proved in evidence, that the road had subsided because of the drainage works, and it was argued that this settlement should have been sufficient to suggest the idea of danger to the Company, and cause them to keep a specially watchful eye upon their pipes. It was not, however, till twelve years after the road had been disturbed by the constructing of the sewer that the gas-main was actually fractured. On a

December morning the occupants of one of the houses in the road were by some providential circumstance awakened before their usual hour. They found the house charged with gas, and before they could reach the door one of their number became insensible, and all suffered from nausea and the usual effects of partial suffocation from inhaling gas. Fortunately, there appears to have been no light or fire left burning in the house, or the effects upon the inhabitants would probably have been very much more serious than the slight discomfort and loss which were proved at the trial.

Upon opening up the road outside the house, it was found that the main was broken through, and that the gas had made its way along the outside of a disused service-pipe which had supplied a former tenant with gas, and so gained entrance into the house, and caused the annoyance. The breakage of the pipe had not occurred at the point where the service-pipe had been connected, and which was then plugged up, but at some little distance from it, and immediately over the trench in which the house drain had been laid. This trench was found to be still in a loose and unsound condition, while on either side of it the ground was firm as in the rest of the road. The Gas Company contended that the cutting away of the solid earth under their pipe and the inefficient filling in of the trench had not been done by their servants; that they had no notice when the branch drain was laid; and that, consequently, they should not be held liable for the results of such faulty work, over which they had not been able to exercise any control. The Judge (Lord Coleridge) took this view, and summed up the case strongly in favour of the Company. He failed to see any act or omission whatsoever on their part which could be called an act of negligence, and ridiculed the idea of Gas Companies being under an obligation to open down upon their mains for the mere purpose of satisfying themselves that all was right, unless there was some reason to suppose the contrary. The Jury promptly returned their verdict in accordance with the Judge's ruling, and so this really important case, carefully argued out apparently on both sides, was decided in favour of the Company, and will serve as a precedent for the future, barring the way, we do not doubt, to many similarly adventurous actions which would otherwise be taken.

It remains to us now, guided by the case we have thus briefly noticed, to remark upon the general question of the liabilities attaching to Gas Companies in regard to the breaking of their mains or the escape of gas from them. It is satisfactory to know that in the case of an explosion or other damage caused by an escape of gas from a street-main, it is not only necessary to prove the escape, but also that it was due to some cause which reasonable care and foresight could have prevented, before damages can be obtained. It is also eminently useful to have so clear a ruling that the onus of proof in such cases rests solely with the plaintiff. Lord Coleridge says: "In a case like the present, the onus lay on 'the plaintiff, who must show some act of negligence; he must put his finger on some act done wrongfully, or 'wrongfully omitted to be done, on the part of the defendants; and if he did not do that he did not discharge the 'burden which the law cast upon him, and he must fail.' This obligation may possibly press hardly upon the sufferers in some particular case, but it is clearly just as a rule. Were it otherwise, the mere presence of the escaped gas in a house would be *prima facie* evidence of the responsibility of the Company supplying the district, and evidence on the part of the Company would be liable to be received with suspicion as an effort to evade a just burden.

The case we are considering is thus far satisfactory. It is impossible, however, to look into the question at all without feeling how grave are yet the responsibilities, even when fairly and equitably judged, which rest upon Gas Companies. How wide or how narrow an interpretation may be put upon the phrase "reasonable care and foresight," and what an immense difference there may be in the minds of two jurymen as to what amount of intelligence might properly be ascribed to the typical "reasonable man," with whose behaviour that of ordinary workmen and officers is to be compared. But apart from this, it is part of the almost daily experience of Companies supplying large towns, that trenches are opened alongside their pipes, and to a greater depth, or even that the ground is taken away entirely from about them, and they—the pipes—slung to the timbering of the trench, until the sewerage or other works are completed. In such cases it is the practice, as it is clearly the duty of gas managers, to watch the works in progress, and the filling-in of the trench; but no watchfulness and no attention to the ramming of the trench can make it as solid as the neighbouring earth, or prevent

the subsequent settling of it. Especially in clayey soil it is better, if possible, to remove the main to a solid part of the road, even if the expense of removal has to be borne by the Company. We had occasion to notice a case recently, where a sewer had been laid down under the line of a gas-main. The settlement of the trench was fairly uniform, and the main itself did not break. The service-pipes, however, along the line of the main were repeatedly severed from it, and considerable quantities of gas escaped. In this case the contractor for the sewerage works recouped the Company for the expense of repairs, and acknowledged his liability for the value of the lost gas; but it would have been better for both parties if the main had been removed before the sewer excavation began. We are of opinion that enough is not done by Gas Companies generally to fix the responsibility for damage of this description upon the parties doing the work. There is even an excess of amiability governing the action of the Companies towards the Road Authorities. This is a matter of little moment, perhaps, so far as it relates simply to the damage and loss at the time; but in view of such contingencies as we are now considering it is of great importance. It is clearly just that if a man is injured in person or property by an escape of gas due to causes that might have been avoided, he should be entitled to compensation, and that his natural claim is against the Gas Company. If the Company have, without remonstrance, attended to, possibly repaired or relaid the main which has been damaged, they have accepted the responsibility for what may happen. If, on the other hand, they require the local authority or their contractor to make good defects caused by their work, there would be little or no difficulty in bringing home a liability to them for an accident which might happen even years after. The verdict in favour of the Chartered Company was given on the ground that they did not know of the works being done which caused the breakage of their main, and there was no evidence, in the condition of the road itself, to lead them to suspect danger. The Judge said: "If they [the Company] had known beforehand what was going to happen, and if by some known mode of operation they could have prevented the possible sinking of their pipe, there would have been reasonable evidence of negligence to be left to the jury." Now, in the great majority of cases it would be impossible for the Company to plead ignorance of the work being done, and the onus is clearly on them to preserve their pipes intact, either by their own act, or by insisting on due care on the part of those causing the danger.

Mr. G. W. Stevenson drew attention to one aspect of the question well deserving attention. He had ascertained the fact that the cross drain which in Johnson's case caused the mischief, was laid partly by tunnelling; and he pointed out how difficult it is to replace substantially the earth so removed—a difficulty which is the more important because supervision is almost impossible. Tunnelling is often carried on sufficiently near the surface of a road to affect the pipes laid in it, and yet, as Mr. Stevenson remarked, the subsidence might not be observed, because the hard crust of macadam or other covering remained intact. In such cases, when a fracture does take place, the difficulty of discovering and repairing it is increased largely by the distance to which the gas may travel through the loose earth before it finds vent, and special watchfulness should be used by the Company's officials to save or remove their pipes from danger.

It is fortunate that this action was brought against a Company who were not afraid to fight it out. What we want is not mere triumphs in the Law Courts, but settlements as clear as may be of what are the responsibilities and what the rights of Gas Companies; and from this point of view compromises and settlements out of court are much to be deprecated. With the knowledge we have from experience of the tendency an average jury has, in claims for damages, to decide, if possible, adversely to a public Company, we do not wonder that many small and comparatively poor ones prefer to pay rather than fight. So long as there is so little unity of action this will remain an evil to deplore, but still an evil that will last. We have repeatedly urged the necessity for combination on the part of Gas Companies to watch and defend their interests, whether in Parliament or the Law Courts, where they may be assailed. Large and wealthy Companies should be willing to give their help to the smaller ones in such an effort, and the latter should willingly contribute to a fund that, in case of necessity, would give them all the advantages attaching to their more powerful neighbours. The Gas and Water Companies Association was formed for this exact purpose; it has had many opportunities of proving how excellently it can do the work required; its members know how valuable is the guidance and advice which it is prepared to render in case of

necessity; and yet it has, we believe, recorded upon its books only a very small proportion of the Companies for whose advantage it was formed. The Companies who stand aloof, either in ignorance or indifference, are themselves the losers; but they do also, by their abstention, weaken the Association and the power of service which it would otherwise possess.

The resemblance may not be at first sight apparent between the Corporation of Hanley and the late British Army which fought in the Peninsula. It is clear, however, that in their inability to recognize when they are beaten there is a striking likeness. The perseverance of the Corporation is worthy of a good cause, if not of a better than that they are pursuing. They opposed some years ago an application of the British Gas Company for amended powers, and were defeated; they afterwards applied for a Bill to give them compulsory powers to purchase the Company's undertaking, and their application was rejected; we publish in this week's issue a report of the opposition raised before a Committee of the House of Lords this session to the authorizing of further capital by the Company to be expended in Hanley, from which it will be seen that the Corporation were again unfortunate. Notwithstanding all these failures, the Town Council resolved last week, almost unanimously, to continue their opposition in the Commons, and their determination is evidently strong to persevere in their efforts until they become the happy possessors of the works they have so long desired. Such perseverance is usually in the end successful. In this case the Corporation are, no doubt, prepared to offer liberal terms to the Company, and it may be worth the consideration of the latter whether it is desirable to continue incurring the expense and vexation of this persistent warfare. The Corporation point to the neighbouring towns of the Potteries, where, under the management of the respective Local Authorities, not only do the gas-works pay their way, but yield handsome surpluses for the relief of the rejoicing ratepayers, while the price of gas is not higher than in Hanley. In this case there is no attempt to disguise the truth, that the opposition is being conducted not by, or in the interest of the gas consumers, but of the ratepayers, though apparently the consumers are at least consenting parties. If it is a fact that the British Company have been unable to earn their full dividends out of the Hanley business, this is a very weighty reason in favour of their entertaining the offer to purchase, especially as the limitation of their new capital to a dividend of five per cent. has taken away much of the advantage which used to accrue to a Gas Company in their position, from growth of business and increase of capital. It is certainly a matter of much interest—which was not made clear in the evidence before the Lords—how the Company, failing to earn full dividends, have yet been able to divide them. This will probably be explained in the course of the further progress of the case.

The Corporation of Dublin, or rather so much of that august body as is concerned with the highways and pavements of the city, have betrayed a somewhat narrow spirit in the course of some negotiations which have lately been going on between the Local Authority and the Alliance and Dublin Consumers Gas Company. It seems that the Corporation, being about to dig up the streets for the purpose of paving them, in lieu of macadam, communicated their intention to the Gas Company in the month of November last, with a view to getting new mains and services laid before the paving was proceeded with. The Gas Company replied that, in order to avoid disturbing the new pavement afterwards, they would make a thorough examination of their mains, and lay down new services at all points; would go on with the work during the winter, so that the disturbed soil should have time to settle before the paving was laid; and that all cost of opening and making good the ground, and other expenses, would be borne by the Company, provided that the Corporation would forego their claim for repairing the surface. As the surface referred to was speedily to be done away with entirely, it is hard to see the unfairness of the Company's proposals. On the contrary, their willingness to incur the expense of new services and other renewals, in order to spare the Corporation and the public the annoyance of seeing a new pavement broken up unnecessarily, certainly merited better acknowledgment than it received. However, it will not surprise any one accustomed to observe the ways of corporate bodies when they see their way to a "deal," to find that this reply of the Gas Company led to a vast amount of negotiation and correspondence, resulting in the passing of a resolution by the Committee, to the effect that the Gas Company should pay half the cost of repairing the surface. This resolution was not agreed to by the Company, who decided,

in default of worthier co-operation on the part of the Committee, to let matters go on as they were. Upon this the just and wise Committee threatened to raise their charge for repairing the street openings made by the Company, to which proceeding the Gas Company again objected. The end of the squabble is that the Company have waited until the streets were opened for paving to do what they wanted to their pipes, much to the annoyance of the Corporation, who are doubtless aggrieved at having failed to obtain payment for work which they did not intend to perform.

Some question appears to have arisen at Leicester respecting the different rates charged by the Gas Committee for the hire of gas stoves and meters. A stove valued at £3 is let on hire for 6s. a year, while a meter costing less than £4 brings in 20s. a year rental. This discrepancy was explained, to some extent, by the Chairman of the Gas Committee at a recent meeting of the Town Council, with reference to the different uses to which stoves and meters are put, the one being distinctly instrumental in increasing the consumption of gas, while the other is merely a registering apparatus. With more reason it was shown that the cost of repairs and connections to stoves were borne by the consumers, while meters were repaired and fixed at the cost of the Corporation. This is all very well so far as it goes, but it does not justify such a marked distinction in the rates of hire of the two classes of apparatus. It is not fair to consumers or producers to charge too much or too little for the use of necessary appliances—meters or anything else. Meter-rents ought never to form a too conspicuous source of income in any locality, whether the opportunity of contrasting their cost with that of stoves exists in the same place or not. As long as the meter-rents return a fair margin over the cost of repairs, &c., their owners should in all cases be satisfied, as their customers will always be better pleased to pay for gas than for the use of appliances for using or measuring it.

West Bromwich, the first of the South Staffordshire districts which has separated its gas interests from that of Birmingham, has now entered upon an independent existence. Punctually at 6 a.m. on the 1st instant the gas was cut off from the supply-main of the Birmingham Corporation works, and later in the day the Chairman of the West Bromwich Commissioners, having paid over to the Birmingham Gas Committee a handsome cheque for £70,750, by way of quittance, turned on the main valve from the new works, and declared the undertaking formally open for the supply of gas to the town. The occasion was one of considerable local rejoicing as the celebration of the last act of a drama which has been played out during the past few years, pleasingly diversified with stirring combats in Parliament and the Law Courts, and carried on with considerable expenditure of cash. The West Bromwich people, however, seem to think "the game" has been well "worth the candle," and with much reason. Now that they can supply themselves, it is to be hoped they will be able to please themselves, by maintaining their gas of as good quality as that which they have had hitherto, and possibly at a cheaper rate.

The administration of the Hawick Gas Company's affairs is somewhat noteworthy. Without legislative enactment, by certain provisions in their contract of co-partnership, they devote their profits, after meeting capital charges and providing for a depreciation-fund, to reducing the selling price of gas; and the consequence of this arrangement, as exemplified in the last year's working of the Company, is that their gas, of 29 to 30 candle power, is now selling at 3s. 6d. per thousand feet. Hence it will be seen that the Hawick gas consumers could not possibly gain anything by the undertaking being transferred to a Local Board, or whatever may be its Scotch equivalent in their case. It should be remarked that the full dividends have been paid for the past year, although the price of gas was reduced fivepence per thousand feet, thus showing the elasticity of gas revenues even in small places.

The Master of the Rolls had a fine opportunity of demonstrating the importance of the study of words, in connection with the cross actions of *The Isle of Thanet Gas Company v. Davis and Davis v. The Isle of Thanet Gas Company*, which came before him on the 29th ult. The point at issue was the meaning to be attached to the word "adjacent" occurring in the preamble of the above-named Company's Act of Parliament. The Company, relying on their Act, had laid pipes along the public highway which passes through Mr. Davis's land at a point about 2½ miles, as the crow flies, from the Margate boundary, up to which their rights were undisputed. But although they have a right to lay pipes in Margate and parts

adjacent, it was contended, on the part of Mr. Davis, that the said point was not adjacent, as it was nearly three miles away, and he therefore sought to have the Company restrained from laying pipes through his property. In the course of the argument, there was a great searching of dictionaries; and learned disquisitions on philology, that would have delighted the soul of Archbishop Trench, were delivered from bar and bench. Finally, with sole reference to the case in point, without desiring to settle the general meaning of the word, the Master of the Rolls decided against the Company, so that three miles, or a trifle under, cannot be considered henceforth as "adjacent," whenever the neighbourhood of Margate is mentioned, whatever it may be in other localities. In fact, Mr. Clitty, Q.C., produced an American dictionary to show that the "adjacent" did not mean the same thing across the Atlantic as it does in England, but Sir George Jessel was not to be caught in this way. He perhaps thought that in a land where everything is on such a large scale, three miles is of no more account than "over the way," or "round the corner," or other such familiar English equivalents for "parts adjacent" in our own small island. The moral of all this is that parliamentary boundaries should always be clearly mapped out, as indeed is generally the case with modern Acts; but there are many Gas Companies working under the protection of Acts as vague as that in point, which, as it now appears, may be read only in accordance with the dictionary commonly used by one of Her Majesty's Judges.

ILLNESS OF MR. F. J. EVANS.—Our readers generally will share the sincere sorrow with which we record the serious illness of Mr. F. J. Evans. On one of the hot days of last week, we are informed that Mr. Evans had been engaged for some hours in his laboratory, at his house near Brentford, only leaving it to prepare for dinner. Shortly after he had entered his dressing-room a fall was heard, and upon going to the room it was found that Mr. Evans had been attacked by paralysis, and was unconscious. He has remained in a very critical condition ever since, and upon inquiry yesterday no improvement was reported. We earnestly hope that next week we may have the happiness of intimating that the present danger is past.

ACCIDENT TO MR. JOHN STORER.—It is with much regret—in which we shall be joined by very many of our readers—that we hear of an accident which last Monday befell Mr. John Storer, the Secretary and Manager of the Stafford Corporation Gas Department. In connection with an extension now being made to the reformatory-house at the Stafford Gas-Works, Mr. Storer was visiting Messrs. Westwood and Wright's iron foundry at Brierley Hill, inspecting some castings, and whilst passing through the works, his right foot was caught between two rails, and he was thrown down, and, falling on another rail, the large bone of the right thigh was broken. Assistance was at once obtained, and Mr. Storer was conveyed to the house of a friend at Dudley, where the swelling of the wound, and the bone set the same evening, and he is now progressing favourably.

LANARK AND BLANTYRE WATER SUPPLY.—Two Bills complimentary of Provisional Orders made under the Public Health (Scotland) Act, 1867, are now before Parliament. One relates to the burgh of Lanark, and confers on the Local Authority—that is, the Provost, Magistrates, and Town Council—the power to make every provision for an adequate water supply to the inhabitants of the burgh. It gives them authority to put in, or alter, or all the water, roads, or lands connected with the place, and the bone set the same evening, and he is now progressing favourably. Similar powers are conferred upon the Parochial Board of Blantyre, in reference to the Lees Burn. The Local Authority is not to abstract water from the burn at times when less than 20 gallons per minute are flowing, and a gauge is to be established, for the satisfaction of all persons interested in the supply of water. It is also provided that on the application of 20 persons, who receive the water, for the establishment of sand filters, the Sheriff-Substitute for Hamilton district shall, upon being satisfied as to their necessity, compel the Parochial Board to provide and maintain them.

SOCIETY OF ENGINEERS.—On Tuesday last the Members and Associates of the Society paid a visit to the South Metropolitan and the Crystal Palace District Gas Companies works, by permission of Mr. G. Livesey and Mr. C. Gandon. At the Old Kent Road works the party were received by the former gentleman, who, with the assistance of Mr. F. Livesey and Mr. Somerville, explained the several operations connected with gas manufacture as each department was in turn visited. The latest novelty at these works—the apparatus for preventing the oscillation caused by the exhaustor, which formed the subject of the paper read by Mr. Somerville at the recent meeting of the British Association of Gas Managers, and was given, with illustrations of the apparatus, in the last number of the *Journal*—was an object of special interest to some of the visitors. The chief feature of attraction was, however, the large concrete gas-holder-tank, which has been for some time in course of construction, and is now approaching completion; and the details given by Mr. Livesey respecting this great excavation, and the gigantic boiler it is eventually to contain, were listened to with much interest. On the completion of the inspection, the President of the Society (Mr. J. Bernays) thanked Mr. Livesey, on behalf of the members and their friends, for his kindness in giving them an opportunity of looking over his works—an opportunity which Mr. Livesey, in his reply, said would be always readily afforded to any member of the Society whenever he felt disposed to avail himself of it. The party then proceeded to the works of the Crystal Palace District Gas Company at Lower Sydenham, where they passed a couple of hours in accompanying Mr. C. Gandon round his works, which were left soon after five o'clock; the rest of the day being spent at the Crystal Palace, where the members of the Society and their friends dined together.

Water and Sanitary Notes.

WHAT is to be the issue of the investigation now going on before the Select Committee on the London Water Supply is what nobody knows, unless Sir W. Harcourt has something practical to reveal, which appears exceedingly unlikely. Six days have now elapsed, extending over three weeks, and everything is where it was. We are not certain that Mr. E. J. Smith is yet disposed of as a witness, and of course there are others to follow him. Mr. Smith tells the Committee that if a Bill endorsing the provisional agreements "be passed in the course of the year 1880," the Companies will be bound to those agreements. This is a great "if," and the prospect of any Bill dealing with the Metropolitan Water Question being passed in the present session appears eminently unlikely. If any power can put an end to the complication, it is on the side of the Water Companies. If they would offer to go to arbitration, or make some abatement of their terms, it is just possible that an impetus would be given to the parliamentary proceedings, and something practical would be the result. But there are difficulties in the way, for the Home Secretary expressed a doubt, before the inquiry commenced, whether the Companies ought to be purchased at any price. Seeing how keenly he has since disputed the bargain with Mr. Smith, we might infer that Sir W. Harcourt is pre-eminently anxious about price, and would agree to purchase if the terms were materially reduced. If, after all, the question of quality is to be debated, the Counsel for the Companies may have to watch the fray for a long time.

It would certainly be interesting to know what the Home Secretary is "driving at" in this inquiry. He quarrels with the price to be paid for the Companies undertakings, and, so far as he has made his ideas known, he is equally dissatisfied with the quality of the water supplied. Are we to suppose that the present inquiry is simply to have a negative result? Is the issue of it all to be that of getting the public to believe that the Companies have asked too much, and that the Water Supply of the Metropolis is not worth having, even if the price be reduced? Are the Select Committee merely to clear the way for some grand aqueduct scheme, which is to glorify the memory of Sir William Harcourt? As the inquiry goes on, we shall probably get clearer light, but we doubt whether the prospect will be one upon which the public ought to be congratulated.

On Friday last Mr. Smith acquitted himself more deftly before the Committee than on any previous day. Whether the absence of Sir W. Harcourt gave relief to his mind, or whether the questions were such as admitted of more *piquant* answers than could be given to the queries of the Home Secretary, we cannot determine. But it were much to be wished that Mr. Smith had in the first instance been questioned by Counsel in support of the Purchase Bill. Sir W. Harcourt is not favourable to that Bill, and, however impartially he may desire to act, his interrogations are not likely to bring out such good points as the scheme may possess. Mr. Smith defends the provisional agreements as the best that could be made under the circumstances, and he contends that purchase by agreement was the only available course. A compulsory purchase would be costly, and competition was impracticable. Questions were asked of the witness which were obviously suggested by the idea of buying up some of the Companies only. Mr. Smith demurred to such a scheme as contrary to the rules of economy. Everything, in his mind, pointed to the necessity of consolidating the Companies, and an arrangement which left out even one only was fatally imperfect. As for introducing an entirely new Company, this would simply be creating a ninth, which would have to be bought up ultimately along with the eight. In any scheme of competition there was also a doubt whether the public would, in all cases, consent to be served by the new corner. The difficulty of laying down an additional set of mains was itself a serious matter. The evidence of Sir J. Bazalgette in the case of the scheme for bringing sea water from Brighton to London was available for showing that in certain thoroughfares at the West-end there was not space left underground for any more pipes to be laid. If this is the case at the West-end, much less is it likely that extra pipes could be conveniently laid in the more crowded parts of the Metropolis. The explanation is now offered that Sir J. Bazalgette's objection only applied to two particular streets. But we apprehend that his evidence on this point was understood at the time to apply so generally to the sea water scheme as to demonstrate its impracticability.

It is urged as an objection to the quality of the present water supply, that deaths from diarrhoea and simple cholera

increase with a rise of temperature in the river. But this indictment is obviously founded on a very narrow view of the circumstances. The rise of the temperature affects the sewers and drains as well as the water supply, and the whole atmosphere is directly influenced. Mr. Smith very properly showed, in his evidence on Friday, that the district of the Kent Company was a far more open and healthy one than that which is occupied by the population dependent on the water supply of the East London Company. Reference being made to the reports of the Rivers Pollution Commissioners condemning the Metropolitan Water Supply, Mr. Smith asked concerning the Commissioners: "Who are they?" Of course, at the utmost, there are but two of these gentlemen, and in respect to the chemical analyses all depends on one of the two. In everything that is said by "the Commissioners" that impugns the character of the supply, we have simply the authority of Dr. Frankland.

A discussion took place at a recent meeting of the Commissioners of Sewers as to whether the Commission should take action separately from the Corporation in respect to the inquiry before the Select Committee on the London Water Supply. Some of the speakers agreed that the Commissioners represented the ratepayers of the City, which the Corporation did not. On the other hand, it was remarked that the Commissioners were not the Local Authority on the Metropolitan Water Question. All that concerned them was the quantity of water required for watering the streets and for general sanitary purposes. The Special Committee of the Corporation were acting under instructions, of which the resolutions of the Commissioners formed part, and eight out of the twelve members of the Special Committee were members of the Commission. It was also important there should be no appearance of division. Among those who were desirous of seeing the Commissioners take some separate action in the matter, anxiety was expressed that the Select Committee should be thoroughly enlightened as to the charges made for the supply of water in the City. In debating this part of the question, remarks were made by some of the speakers, which clearly proved that whatever the charges were at present, they were capable of being carried to a much higher pitch. Thus it was not merely the present rates of which complaint was made, but also the much higher ones which were looming in the distance. It was stated by Mr. John Cox that notices were being sent over the City, announcing an increase of rates, and as it was probable that the rateable value of the City would be as much as four millions next year, the prospect was a serious one. These several points having been discussed, it was decided at last to leave the matter where it was, in the hands of the Corporation.

The Metropolitan Board lately proposed taking steps to have a Bill brought into Parliament which, if passed, would enable them to expend money in promoting their views on the Metropolitan Water Question. The idea was to amend the 144th section of the Metropolis Local Management Act, so as to escape all risk of having expenditure on the Water Question disallowed by the Government Auditor. The present Home Secretary appeared to favour the proposal, and asked that a Bill for the purpose should be drafted and submitted to him. This it was resolved should be done. Mr. Jones, of the Strand District, was so gratified with the prospect which thus presented itself, that he withdrew his notice of motion, which was—"That the Parliamentary Committee be instructed not to commit the Board to any line of procedure with respect to the inquiry as to the Metropolitan Water Supply, without giving the Board an opportunity of 'expressing its opinion thereon.'" If the proposal to let the Board spend money on the Water Question induced Mr. Jones to withdraw this motion, the logical sequence is not so clear to us as it is to him. That the Board is capable of spending a lot of money on the Water Question, without doing any good, has already been proved; and Mr. Jones may find it necessary to exercise continued vigilance. Concerning the alteration of law, it is now suggested by the Home Office that a clause might be inserted in the Loans Bill of the Board which would effect all that is desired. Before acting on this suggestion, the Board have to consult "my Lords" of the Treasury, who may not, perhaps, altogether approve of the notion, seeing that it tends to diminish the power of the Auditor, with whom they annually terrify the authorities at Spring Gardens.

The Chelsea Water Company have shown their readiness to let in the light on their proceedings by inviting various authorities to an inspection of their works—an event which took place last Saturday week. The invitations were singularly impartial, including Dr. Tidy and Dr. Frankland, as well as Lieut.-Col. F. Bolton, Dr. W. Pole, and Mr. T. Hawksley, with

other notabilities. At the luncheon which followed, sundry speeches were made. One of these was by Dr. Frankland, who put his view of the case very cleverly. "He would not say a word as to the quality of the Thames water itself;" but he recognized the fact that the Companies had incurred enormous expense in removing their intakes to, "at all events, a less objectionable part of the river." He also felt compelled to admit that the Companies had of late years done everything that was reasonably within their power to improve the supply. So far this is an answer to those consumers who complain that they are charged a higher price now than formerly, although, as they contend, nothing has been done to improve the quality of the water. On this point, of course, Dr. Frankland had nothing to say; but he finished off with a statement which was tolerably fair. He observed that "it was easy in a laboratory to criticize the defects of the supply, but it was quite another thing to do so in practice." The meaning of this, we presume, is that it is an easy thing to find fault, and a difficult thing to attain perfection. Dr. Frankland will doubtless find that there are some people who are even capable of grumbling at the deep-well water that comes out of the chalk.

The Liverpool Water Bill has passed the Select Committee of the House of Commons, to whom it was referred, and a special report has been presented to the House, which has been ordered to be printed. In the discussion of clauses last week, opposition was offered by the Widnes Local Board, who claimed a portion of the supply to be drawn from the Vyrnwy. The Liverpool Corporation were willing to deal with the Widnes Board by agreement, but objected to compulsion. After some discussion, Mr. Pembroke Stephens, who appeared on behalf of the Widnes authorities, said he was quite willing that, if at any time the Liverpool supply proved insufficient to allow thirty gallons per head of the population, in such a case the claim of Widnes should be subject to a preferential right on the part of Liverpool to that extent. The supply taken by Widnes would, of course, be paid for. Ultimately the Committee decided to admit a clause obliging the Liverpool Corporation to supply water to Widnes on the basis thus proposed, the water from the wells to be included in the reckoning of the thirty gallons, so long as such water was approved on sanitary grounds.

The South Staffordshire Water Company's new works in the neighbourhood of Cannock are to be formally opened on Wednesday, the 21st inst., on which occasion it is expected that representatives of some 18 or 19 of the Local Boards within the Company's area will be present. These large additional works are rendered necessary by the ever-growing requirements of the population supplied by the Company, their district occupying something like 800 square miles, and containing more than half a million people.

NOTTINGHAM SEWAGE FARM.—The works in connection with the Nottingham Corporation Sewage Farm, which have now been in hand some years, and upon which about £150,000 has already been expended, having reached a state bordering upon completion, on Thursday, the 24th ult., the Sewage Farm Committee inspected the works at Stoke Bardolph designed for the utilization and disposal of the sewage of the borough. At this preliminary opening a portion of the sewage farm, which is 640 acres in extent, designed for a population of 180,000, was placed under irrigation, the "carriers" being fully charged when the sluices were opened by the Mayor (Sir James Oldknow) and the Chairman of the Committee (Alderman Barber); subsequent to which the sewage was quickly distributed over the different plots of ground which had been prepared. The farm, however admirably conducted, cannot, it is said, be made to yield an adequate return to the Corporation for their enormous outlay; but the management at all events will, under Mr. Avis, the farm bailiff, leave little to be desired. The Engineer (Mr. M. Ogle Tarbotton) was absent on parliamentary business when the actual work was inaugurated; but has kindly promised to send further particulars at a future date.

THE CONSUMPTION OF WATER IN CITIES.—The *Scientific American* says that, in a discussion in Congress, relative to the water supply of the district of Columbia, the following statement was given of the average daily per capita consumption of water in different cities, the figures being from official reports:—

City	Gals.	City	Gals.
Providence, U.S.A.	25	Detroit, U.S.A.	105
Fall River	26	Chicago	119
Lowell	32	Washington	155
Lynn	33	New York	160
Rochester	35	Albany	80
Columbus	43	Jersey City	99
Lawrence	44	Loudon, England	29
Milwaukee	53	Liverpool	29
Cambridge	55	Glasgow, Scotland	50
St. Louis	56	Edinburgh	88
Cleveland	56	Dublin, Ireland	25
Chicannati	57	Paris, France	28
Philadelphia	58	Tours	22
Baltimore	63	Toulouse	26
Boston	75	Lyons	20
Buffalo	87	Leghorn, Italy	30
Montreal, Canada	69	Berlin, Prussia	20
Toronto	77	Hamburg	33

Mr. A. R. BOWDING, Assistant Manager, under his father, at the Plymouth and Stonehouse Gas Company's works, has been appointed Engineer and Manager of the Neath Corporation Gas-Works, having been selected from 77 applicants for the situation vacated by Mr. C. S. Ellery on his appointment at Bath.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE EFFECT OF THE CONTACT OF TAR AND GAS.

SIR,—Under reference to Mr. Greville Williams's lecture, contained in the JOURNAL, June 15 (Vol. XXXV., pp. 948-9), as to the effect of illuminating gas coming into contact with tar, allow me to draw your attention to experiments, the results of which have been stated more than once in your JOURNAL, as to the effect of tar and other hydrocarbons in reducing the illuminating power of gas when they are brought into contact with it.

If you will refer to a paper read by Mr. Young, of Clippens, before the West of Scotland Association of Gas Managers, as contained in your JOURNAL of June 1, 1875 (p. 809), you will find the subject fully discussed. From experiments made by the late Mr. Cusifer, referred to in Mr. Young's paper, and also from experiments made since, it was found—

1. That when gas, after it had passed the purifiers, was presented to the same tar from which it had been separated in the usual way of condensation, and at the same temperature that they left the condensers, the illuminating power of the gas was but little reduced.

2. That when the tar was reduced below the temperature at which it and the gas left the condensers, and they were then brought into contact, the illuminating power was reduced; or if the gas was reduced in temperature, the same rule applied. Also, that the greater the reduction of temperature, in either or both, the greater was the reduction in illuminating power.

3. That rich gas suffered a greater reduction in illuminating power when brought into contact with tar made from poor coals than when brought into contact with those made from rich coals, the gas and tar being cold; and vice versa.

4. That when cold gas was presented to cold once-run tar (that is, tar from which the spirit and light oils had been extracted) the illuminating power was reduced in many cases as much as 50 per cent.

5. That when gas in condensation was presented to the tars maintained at a temperature of about 190°, the tar did not absorb the illuminants. On the contrary, it carried these forward, and the illuminating power of the gas was thereby permanently and greatly increased, as has been shown frequently in your JOURNAL.

6. That when gas, rich or poor, was presented to tars, as they came from condensers of the ordinary description after the tars had been heated to about 190°, the illuminating power of the gas was greatly increased.

In short, if it is desired that the gas should be made of as great illuminating power as it is possible to do from the nature of the coal used, it is necessary that the condensation should be so effected that the tars and gases should not come into contact at a less temperature than about 190°, and it is on these lines that my patent works.

Darroch, near Falkirk, June 25, 1880.

HENRY AITKEN.

THE SCIENTIFIC USE OF COAL GAS.

SIR,—In reply to your correspondent, "Alex. M'ivor," in the JOURNAL of June 22, I beg to inform him and your readers generally that what I mean by a non-actinic light is that kind of light—sufficiently powerful for the purposes of reading, drawing, or working—from which the actinic or chemical ray has been divested or filtered out.

The actinic or chemical ray, as many of your readers know, is that invisible portion of the solar spectrum beyond the violet ray. Thus, in the solar spectrum there is, first in order of velocity of movement, the invisible heat ray; then the red ray, followed by the orange, yellow, green, blue, violet; and, lastly, the invisible actinic or chemical ray, moving with the highest velocity. The last is that part of solar light which decomposes the silver on the prepared photographic plate. It also affects in a similar manner all organic substances, and produces a sense of fatigue in the human eye more rapidly than any of the other rays of which sunlight is composed.

This fact will readily be perceived by any one who will attempt to read a book printed on white paper in the open air on a bright sunny day, unshaded by trees or other suitable screen. The effect produced by this strongly actinic light will inevitably be sleep—a sure sign of fatigue in the visual organs.

Green fields and trees serve as correctives to the actinic ray of strong sunlight, the light reflected from green surfaces being almost devoid of actinism. Hence the difficulty of photographing trees and fields, and it is for this reason that on bright sunny days the view of trees and green fields is so grateful to the sight.

Now, artificial light, being composed in like manner with solar light, is also actinic. The degree of actinism reached by artificial light varies not so much according to the illuminating power of the light, as it does with its intensity. A light of low illuminating power may be highly actinic, and vice versa. Thus a well-made spermaceti or paraffin candle is highly actinic; a large brazier of red-hot coal is of great illuminating power of low intensity, but is not actinic. The image of the candle can be photographed on the wet collodion plate in less than 10 seconds; the image of the brazier of coals can only be photographed at all by such skillful photographers as Captain Abney, R.E., of South Kensington, who has succeeded, by a dexterous manipulation of chemicals, in photographing the red ray. But for all this, the light emitted by the brazier may be equal to more than 1000 candles. The electric light, on the other hand, is highly actinic, and the little intense spark from which the volume of light is produced, will photograph itself in an inappreciable fraction of time.

The actinism of ordinary gaslight varies very much, Argand burners being of less actinism than flat-flames, and requiring a longer time to photograph themselves than a flat-flame of the same power does. Thus a Wigham burner, of 200-candle power, will produce a photograph in about the same time as a 400-candle power Argand burner surrounded by a chimney.

An artificial light, no matter how it is produced, suitable for reading or drawing, should be nearly non-actinic. This is the kind of light

which one gets in an ordinary well-lighted room into which the sun's rays do not penetrate—a light easy and comfortable to the eyes. A yellowish tint, or even a greenish tint, in the glass renders this light still more agreeable. A candle—as usually made use of, close to the eyes, and rather lower than the level of the sight—is as far as possible removed from this state of things. Its sharply high-actinic rays are darted into the eye whenever the reader lifts his head; and the diaphragm of the eye is kept in a state of rapid and distressing movement. The light on the paper is too little—6 or 7 minutes would be required to produce a photograph of it—the head is lifted a little, and a ray of light is shot into the eye, which photographs the image of the flame in 7 or 8 seconds. Hence the injury to the sight by the use of candles for reading or studying.

An open gaslight is really not so bad, because it is always used at a height much greater from the head, and unless the reader looks up, in thought, at the light, he does not suffer so much from it. But a light suitable for working with must possess that great property of daylight—perfect steadiness, with uniformity of illuminating power. Any unshaded light, whether gas, or candles, or lamp, cannot fulfil this important condition. Light must fall on the eyes as well as on the paper, or the diaphragm of the eye will be kept in perpetual movement—a state which it cannot long support. Sudden slight variations of illuminating power in the eye are extremely fatiguing and injurious; therefore a flickering light is bad. But the light which falls on the eye should, in my opinion, be red, or, at least, devoid of actinism. This can be effected by putting behind the reflector of the lamp a ruby-coloured glass. Orange or yellow glass will do if the person who is going to use it does not like red. The reflection from a paper lighted by a good Argand burner of 18-candle power fixed at 18 inches, from the paper will be such that a photograph of the page of the book could be taken by a wet collodion plate in about 3 minutes. This light will be about equal to that in an ordinary lighted room by daylight. The red ray falling on the eye will protect it from the reflected actinism of the light. Or, for some persons with very weak eyes, a rose-tinted screen may be used, so that the light thrown on the paper may be slightly rose-coloured, in which case the light will be devoid of actinism. With such a light a person with very weak or delicately sensitive sight may read or write in comfort for hours together.

A steady flat-flame burner may be used (notwithstanding it is more actinic than an Argand), if the precaution is taken to surround the light with a ruby glass, or a ruby glass screen is interposed between the light and the page of the book.

I trust I have sufficiently explained what I meant; but if your readers desire any further information on this highly important subject, I am always at their service.

WILLIAM SUGG.

Westminster, June 26, 1880.

BARKER'S CENTRAL SYSTEM OF GASROLLERS.

SIR,—I am sure my brother ought to be much obliged to you for your very complimentary remarks respecting his paper on "Gas-holders," published in your issue of June 22. At the same time I fear he must have felt great disappointment on finding an entire absence of figures and calculations, and very little argument, in your article; but in their stead a string of generalities, questions, and vague doubts. I beg permission, therefore, to offer, in explanation and reply to your doubts, a few figures, &c., which I will make as concise as possible.

I will not follow you by commencing at the top of the holder, but, on the contrary, at the foundations; because, if any real doubt exists as to the foundation or the stability of the column, argument on all minor matters would be futile.

1. *Pressure on Foundations.*—The column described in the paper was 120 feet high, 20 feet diameter, 30 feet base, 2000 tons weight. The area of 30 feet is 707 square feet; and 2000 tons divided by 707, is 2·83 tons pressure per square foot—a less weight than that on the foundations of most high warehouses, houses above five storeys high, or upon the foundations of gasholder-tanks, including weight of columns and framing. But were this pressure thought to be too much for soft ground, how easy it would be to increase the base 1 foot all round, which would make the area 100 feet more, and thus materially reduce the pressure per square foot.

2. *Stability or Resistance to Overturning.*—My brother correctly stated that a force of 250 tons was required, applied at the top, to overturn the column he described (though I may just say, in passing, that this is double the force it is possible could be brought to bear on your 200 feet holder 100 feet high). This statement has not been challenged, so easy is it to see that it is true. The clearness and simplicity of this (stability) my brother claims as the great advantage of his system.

3. *Strain on Casing of Column.*—You have cast doubt on this point in the following words:—"Would not the iron plates loosen and fall long before the force which would overturn the column could be reached?" A most extraordinary question to ask, seeing how easy it is to ascertain approximately (and not difficult accurately) the thickness of metal required to meet all the strains with certainty. There will be none of the uncertainty which necessarily exists wherever groups of cast-iron columns, braced together, are used. The strength of the central column consists in the wrought-iron casing and upright guides, kept apart so as to act as the flanges of a girder, by the circular joint rings and the rammed ballast or debris, and occasional circular discs of solid concrete. Consequently we have to deal with a simple cantilever 20 feet deep and 120 feet long (in 5 to 1), forming a very rigid structure. The plates only need to be of moderate thickness at the very bottom, and would, of course, be made thinner towards the top; the riveting being so arranged as to secure continuity of strength. Having had myself to superintend the construction of large columns of this kind for deep flooded river bridges, I know how well they answer in every way.

4. *Guide Rollers.*—On the subject of guide rollers you remarked: "The force which might at any time have to be transmitted through a very few rollers on Mr. Barker's plan would be enormous." &c. I fear you cannot have gone into calculation on this point. For example, take the worst possible case—viz., your 200 feet holder 100 feet high, entirely up to a hundredweight of wind on every square foot exposed amounts to 500 tons, but has only the effect of 250 tons, because of the

round surface; 125 tons go to the top rollers, and 125 tons to the bottom. Then, taking your own assumption that only half the rollers act, my brother shows eight groups of rollers, three in each group. Now 125 tons divided by 12 gives 10½ tons per roller, or 31½ tons per group of three rollers, under the worst possible conditions. Is 10½ tons an enormous pressure to provide for? On the contrary, it is a mere bagatelle, considering the slow movement, as every practical engineer will admit.

5. *Guiding and Adjusting.*—On these points my brother spoke very guardedly, and properly so, because he had had no experience on the subject. But in his system there are the same rollers at the bottom as in the outside system, and he believes that, given a stable central column with efficient guides, he will be able to make such guide rollers and frames at the top as will enable adjustment to be effected as easily as at present.

In conclusion, let me say a word on your statement that "he was not followed by a single supporter when his remarks were subsequently discussed." I was not able to hear the paper read, but heard a part of the discussion, and was impressed with the feeling that the speakers were deceived by the disparity in size of the holder (full of wind) and the column (full of solid earth). Nothing is more calculated to deceive the eye, I admit; and it is no disparagement to practical gas managers to say that this subject being almost entirely a civil engineering one, it is therefore not likely to be grasped at once by men who are not experts in construction. But let me strike out a 20 feet or 30 feet circle on the ground and contemplate it, remembering that its height is only four or five times its width, and then make a small model for himself, and his very natural doubts and prejudices will evaporate, for he will awaken to the fact that he is dealing with a "mountain" rather than a column.

You did not refer to the great economy of money and space, and ease of erection, effected by this system, it being clear, I presume, that these must follow in, in other respects, successful adoption.

JOHN BARKER, M. Inst. C.E.

20, Oppidans Road, Primrose Hill, N.W., June 27, 1880.

P.S.—Space will not permit, I fear, for me to go into the question of placing the girders of the present outside system "on flat," instead of "on edge," or it would be quite easy to show that the former is far the most economical plan.—J. B.

[In the above letter our correspondent does not give us much fresh information, nor is his style of argument such as to induce us to change our opinion on the subject in question. He spends much energy in proving certain propositions, respecting the construction and stability of large columns, which we have never denied; while he leaves our remarks on the difficulty of adjusting the holder practically unanswered. He is, moreover, in error in stating that we assumed that half the rollers will always be in action; and we certainly cannot admit the truth of his assertion that the pressure transmitted through any "group" of three rollers is necessarily divided equally among all the rollers which compose the "group." Our correspondent, too, is not happy in the conclusions to which he has arrived, as to the causes of his brother's failure to convince his auditory. After the flattering personal reception which Mr. G. Barker received, we cannot expect to hear that it was only through lack of engineering knowledge on their part that his hearers remained sceptical. We should not, preferably, have introduced this element into the discussion; but as Mr. John Barker has thought fit to do so, we may perhaps be permitted to remark that some of the professional gentlemen present at the meeting, several of whom joined in the discussion referred to, could scarcely be deemed inferior in technical skill and experience to either himself or his brother, or possibly to both together.—Ed. J. G. L.]

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JUNE 22.

GAS AND WATER ORDERS (CONSTRUCTION BILL).—This Bill was read a second time, and committed; the Committee to be proposed by the Committee of Selection, the Holywell Gas Order being opposed by the Holywell Local Board.

LOCAL GOVERNMENT (GAS) PROVISIONAL ORDER BILL.—This Bill passed through Committee.

TUESDAY, JUNE 23.

LOCAL GOVERNMENT (GAS) PROVISIONAL ORDER BILL.—This Bill was read the third time and passed.

THURSDAY, JULY 1.

A petition against the Ackworth, Featherstone, Purston, and Sharlston Gas Bill was presented from George Bradley; and one against the Wigan Improvement Bill, from John Fowden Hodges.

HOUSE OF COMMONS.

MONDAY, JUNE 22.

Petitions against the Rathmines and Rathgar Township Water Bill (Lords) were presented from (1) Corporation of Dublin, (2) Edward Cecil Guinness.

TUESDAY, JUNE 23.

The petition of the Corporation of Oswestry against the Liverpool Corporation Water Bill was withdrawn.

RATHMINES AND RATHGAR TOWNSHIP WATER BILL (LORDS).

Petitions against this Bill were presented from (1) Owners, &c., of mills, (2) Ratepayers and owners, &c., of property in Rathmines and Rathgar and others, (3) Owners, &c., of mills, &c., situate near the River Dodder; Nos. 1 and 2 being against alterations only.

On the order for the second reading of the Bill,

MR. MAURICE BROOKS moved that it be read a second time that day three months. He said the Rathmines and Rathgar township was a very large and flourishing district in the immediate neighbourhood of the borough of Dublin, and it was desirous of obtaining an independent supply of water, the present supply being confessedly inadequate and impure. This was proposed to be done at a cost of about £100,000, and he (Mr. Brooks) was opposed to the obtaining of these powers, because the city of

imposed by various Acts, and could not spend money in Hanley without being authorized by Parliament to do so. The Company were originally established by deed of settlement in 1824, but in 1857 they became incorporated, with limited liability. They had several stations where they extracted gas from the coal, the most important being at the three collieries which supplied the town and neighbourhood of Hanley; they had also stations at Norwich, Trowbridge, and Holywell, and were interested in some works in Clonmel. In 1863 the capital of the Company was £12,800, and by an Act passed in that year further power was given to raise another £30,000, and the same year Parliament imposed on the Company various conditions, one being that the gas was to be sold at the usual rate of 14 pence per cubic foot. Some of the others were then considered of a very exceptional nature—viz., that there should not be more than 20 grains of sulphur in 100 cubic feet of gas, nor more than 5 grains of ammonia. The object of the present Bill was to acquire adjoining land for the extension and improvement of the works, and to give the Company power of borrowing £15,000. It was originally intended that the

dividend to be asked for in the Bill should be 7 per cent., but the Committee were doubtless aware that, by the Standing Orders of the House, it was necessary that the sanction should be applied. There was, however, great difficulty in the Company, the promoters disposing of their shares by auction, and they therefore consented that the dividend on the fresh capital should be reduced to 5 per cent. Since 1866 the amount of gas supplied had been practically doubled, and in order to meet the increased demand it was essential that more capital should be expended, so that the works might be further extended. The Company had not divided the whole amount of profit made among their Shareholders, as there was an amount of £11,328 which they might have appropriated, but which they had forborne to divide. There was one petition against the Bill—viz., that of the Mayor, Aldermen, and Burgess of the Borough of Hanley, who were the Local and Urban Sanitary Authority, and who were also consumers of gas made by the Company. The petitioners urged that the inhabitants would be injuriously affected by the Bill; it was also stated that the gas consumers were entitled to a reduction in the price of gas. The petition then went on: "Your petitioners have long had reason to complain as to the quality of the gas supplied by the Company, and the high price charged by them;" but public analysts had continually made analyses of the gas, and it would be proved before the Committee that every single obligation imposed upon the Company had been fulfilled. There had been no single week in which there had been more than 20 grains of sulphur, and in no case had the illuminating power fallen below 15 candles, but it was always in excess of 15 candles. The petitioners also stated that efforts had been made from time to time to induce the Company to sell their works to the Corporation; and this was really the whole position. In 1877 the Corporation, with the concurrence of the inhabitants, introduced a Bill for the purpose of acquiring the Company's works, and the Select Committee of the House of Commons, after hearing the case of the Corporation, dismissed the Bill without having heard any portion of the case which the Gas Company were entitled to present, thus marking their acquiescence in the proceedings. The Corporation were now endeavouring to raise again the same question, they had no objection as to a reduction of 5 per cent. in no single case had there been a provision inserted by Parliament into any Bill for the compulsory transfer of gas-works to a local authority; and the highest authority in the land—the Lord Chief Justice—had decided that corporations ought not to derive any profit from gas undertakings. He (Mr. Milnes) thought that the Corporation were not entitled to demand 5 per cent., it was an argument in favour of the Bill. The petition further said that, as the Company still absolutely declined to sell their works, the petitioners submitted that no further powers should be conferred. The Gas Company had most economically expended their capital, and it was almost any day that they had not cost more as an ordinary commercial enterprise, and that they had wasted their money. He utterly failed to see that an extension of capital would in any way be to the disadvantage of the Corporation or the consumers; and the Bill being in strict conformity with the various Acts incorporating the Company, he solemnly submitted to give his sanction, as no case could be made out against granting the powers sought for by the Bill.

Mr. Frederic Lane Linging, examined by Mr. JENKS.
I am Secretary to the British Gaslight Company, which was incorporated under the Limited Liability Acts on Nov. 6, 1857. The capital of the Company is £300,000, in 15,000 shares of £20 each, the whole of which have been issued, and the rate of interest is 5 per cent. The number of debentures to the extent of £100,000. Under our Articles of Association we can, by resolution of a special general meeting, increase our share capital. The Company have five stations—Hall, Norwich, the Potteries (one of which is Hanley), Trowbridge, and Holywell; and besides, we have an interest in the works of the Corporation at Stoke Newington. Each branch is managed by a separate manager, and has a separate capital, while the accounts at each place are kept distinct. One set of directors manage the whole of the five branches, visit them periodically, and exercise a general superintendence over the whole of the districts. In 1838 our first contract was made with the Corporation, and since that time we have made additional works at Brownhills, near Birmingham, which aid in supplying the same districts. The amount of capital expended on the Potteries station up to Dec. 31, 1879, was £72,559. In 1858 the Potteries Gas Act was passed, the capital authorized by which was £42,610, and we were to have £20,000 of that £42,610, and the Corporation were to have £22,610, entitled to a maximum dividend of 10 per cent., and on the latter 7½ per cent. The Act of 1858 limits us, as to the erection of works, to the land which was scheduled in that Act. In 1866 we obtained another Act, by which our maximum price was fixed at 3s. 6d. per 1000 cubic feet; the illuminating power at 14 candles; sulphur not to exceed 20 grains, and ammonia 5 grains per 100 cubic feet; and the rate of interest was fixed at 5 per cent. of the Potteries district should be published in the form prescribed. All those conditions have been complied with and treated as binding down to the present period. In 1875 the Hanley Corporation began to make overtures to us for the purchase of our works, but the Company absolutely refused from first to last to sell. In 1877 the Corporation brought in a Bill for the compulsory purchase of the works, but it was thrown out by the Committee without the opponents being heard. Since then further negotiations have been initiated by the Corporation, but the result was to the same—viz., a refusal to part with the works. In February of the present year the Corporation again brought in a Bill, and it was thrown out from the Council, at which the following concessions were asked by the latter—First, that the capital be £20,000, to be raised on debentures at 5 per cent., or else bearing interest at 5 per cent. with auction clauses, and any premium obtained on the sale of the shares be applied to the benefit of the public; secondly, that the Corporation should have the right of the Corporation, and his salary paid by the Company; third, no notice to be given to the Company when the testing of the gas was intended, and which may be made by an officer of the Corporation; fourth, non-treatment of residuals, but if residuals are treated, any loss on such treatment not to fall on the station; fifth, the insertion of a clause that on giving twelve months notice, during a period of ten years, the works to be purchased by the Corporation by mutual agreement, but if that mode be found impossible, then by arbitration. I forwarded a reply in writing to those propositions, expressing the regret of the directors that they could not agree to the terms offered by the Corporation. I have prepared a table showing the average illuminating power of the gas supplied to Hanley from 1866, when it was 14·60 candles, to 1879, when it was 15·76 candles. In September, 1875, the Corporation appointed Mr. Sparkes to be their chemical adviser as to gas, and test apparatus for sulphur, and at the same time Mr. Sparkes was also appointed Mr. Sparkes to act for them, and he retained the appointment till 1879, when he resigned. [Results of the tests handed in.] In the years 1877 to 1879 there was only one case in which the illuminating power fell below 15 candles—viz., in May, 1879, when it was 14·92 candles. During the same period the average illuminating power of the gas was the amount of sulphur in the gas rose higher than 17·42 grains; but in many cases it was only from 8 to 10 grains. After Mr. Sparkes left, Mr. Barlow, the Borough Accountant, was appointed by the Corporation to test the gas for them; but we appointed Mr. Knowles, a gentleman of considerable

chemical experience, to test for us. Since the Corporation Bill was thrown out in 1877, no complaints have been made to us either with regard to the purity or the illuminating power of the gas. Although our price was fixed at 3s. 6d. per 1000 feet, we reduced it, when we did so, as low as 8s. and 3s. 2d. From 1866 to 1873 we also supplied the public lamps at £2 15s. per lamp; and deducting 11s. 6d. for repairs, &c., gives 2s. 5d. per 1000 feet. In 1874 the price was raised to the rate of 2s. 9d. per 1000 feet, and this has continued to the present time. In consequence of having a central office in London and branch offices and administrations at various places, there are some general expenses to which each branch has to contribute its part; the proportion charged against the Potteries station is 1·56d. per 1000 feet sold. The cost at which we are supplying gas is the same as that at which Corporations in neighbouring places are able to supply it. The town of Hanley is a most difficult place to light with gas, inasmuch as the mining operations there are very terrible, and our mains are frequently broken, which causes a heavy charge upon the revenue. It is the highest point in the Potteries, and the leakage must be more there than in neighbouring townships. At Norwich the leakage was 1·56d. per 1000 feet, while at Hanley it is 1·76d. per 1000 feet. The cost in one place as at the other. It has been as high as nearly 24 pence per 1000 feet, but has been reduced by laying out a great deal of money and exercising extreme care. Last year the figure was 14·28 per cent. The Burslem Corporation charge 4s. per 1000, and give 6d. discount if paid within a month. At Newcastle-under-Lyme the charge is 3s. 6d., with 5d. taken off if paid by the 15th of the second month. At Stoke Newington the gas is charged in some villages a short distance away. The Stoke Corporation charge 3s. 6d. to ordinary consumers, and 4s. at Hanford, which is within two miles of the works. The Longton Corporation charge 8s. 6d. within one mile, and 4s. beyond that distance. The Stafford Corporation charge 3s. 6d., with 10 per cent. discount if paid within a month. With regard to interest on new capital, as the Company cannot accept the auction clauses, they are willing, as a compensation to the district, to accept 5 per cent., which gives a better result to the consumers. I have made out a table which shows the amount of gas supplied year by year from 1866 to the present time. The total amount of gas supplied in 1879 from the Etruria works, and in the latter year 130,638,113, so that it has more than doubled, while our capital has remained the same. The land we now propose to acquire comprises 2 acres 1 rood 34 perches, and is well adapted for the purpose of extending the gas-works. For the year ending on Dec. 31, 1879, the total amount of capital of the Company was £100,000, and per ton of coal carbonized, whereas the average of the London Companies is £7 2s. 7d. per ton. We shall not be able to supply Hanley unless we have power to expend additional capital to provide increased works and plant.

[The cross-examination of this witness was deferred.]

Mr. George Wilson Stevenson, examined by Mr. JENKS.

I have for many years known the works and the district of the British Corporation, and have been down to Hanley specially with regard to this application. The whole of the land at Etruria is inconveniently occupied by the Corporation, and I am surprised the Company are not to have a business district created near Etruria. The largest daily make of the Company is between 700,000 and 800,000 feet, and their storage capacity is not equal to 400,000 feet, while in manufacturing districts the storage ought to be equal to at least the largest daily make. The consequence is that the Company are compelled to keep a large reserve of retorts in action, and that is expensive, both with regard to wear and tear and labour. A tank and gasholder ought to be made immediately to hold half a million feet of gas, and that would cost not less than £8000. If this application is granted the amount of capital asked for will be enough to last for 10 or 12 years; the increase of capital is not quite in the ratio of the increase of demand. In 1879 the Corporation had a dividend of 10 pence and 5 per cent. is as favourable to the consumer as the auction clauses, because the public invest their money in a well-established gas company at that rate. I am aware that the Company have not by a great many thousand pounds paid their full authorized dividends. Gas is supplied at Hanley as cheap as it is reasonable to expect it to be done by authority. The Company are very fortunate in having the possibility of acquiring such a site, it being only divided from the present works by a road, and is very valuable.

Mr. Alfred Penny, examined by Mr. JENKS.

I have examined the Company's accounts carefully on more than one occasion, and can state that it is absolutely necessary the Company should obtain more land and raise more capital for the purpose of carrying out their parliamentary obligations. The illuminating power more than complies with the Act of Parliament under which they are working, and the price is such that for many years the Corporation have been able to pay their statutory dividend. There is a sum of £16,000 which the Shareholders would be entitled to receive if they could earn it. When such a price as 3s. 6d. is charged, and when the Company are performing all their parliamentary obligations, I cannot conceive how much better of the consumers would be even supposing the Corporation had the works in their own hands.

[The cross-examination of the above two witnesses was likewise deferred.]

Mr. F. L. Linging recalled, and cross-examined by Mr. BIDDER.

The parent Company is a limited joint-stock company, not in any way under the control of Parliament, but who have obtained parliamentary powers to do different things. It is different from the limited to the dividend payable on the capital of the Company; we divide what we can, and at present pay 10 per cent. We formerly supplied Stoke, Burslem, and Longton; but we gave them up under the direction of Parliament, and were compensated for our mains, goodwill, &c. We did not sell the works, because of the different terms offered by the Corporation. The total expenditure of the Company in the Hanley works from 1826 to the present time has been about £72,500, and we are now asking for £75,000 more. We have treated this case as we treated Norwich and Hull; the capital for the latter place was £100,000, and we applied to Parliament for £50,000 more. The reason we did not insist on the Corporation to have to apply to Parliament again for a long time, it being such an expensive thing.

Mr. BIDDER: If you were an ordinary incorporated gas company applying to Parliament for power to raise more capital, would not Lord Redesdale insist upon the auction clauses being asked for in your petition? The reason I do not insist on the Corporation to have to apply to Parliament again for a long time, it being such an expensive thing.

They are compulsory in this sense—that there is a Standing Order which they should be inserted?—I will explain. In 1878 the York Gas Company—a joint-stock company—applied to Parliament for power to raise more money, and they objected to the auction clauses, and said that if Parliament would grant them 5 per cent. they would accept it, and they succeeded. We have not inserted those clauses because we cannot work them. We do not come to Parliament to raise money for the Hanley station, but to have power to expend more to extend the works.

If you had been an ordinary gas company, the auction clauses being inserted in the ordinary manner, the effect would have been that any additional capital required would have been raised by auction, and the premiums would go to reduce the nominal capital of the Company, and

would make the dividend to be taken from the consumers to be less *pro tanto*—It would be so if we asked for high interest.

So that we are to be deprived of that advantage because you are in this unique position, and you tell their lordships that, owing to the fact of your being a joint-stock company differing from every other company, we are not to have the benefit of the new capital by the auction clauses?—Not at all; you are not deprived of it, because we only ask 5 per cent. for the new capital, whereas if we accepted the auction clauses we should very likely ask to divide a good deal more. We could not raise our capital at 4 or 4½ per cent.

You not only say that the Corporation intimated that they were perfectly willing to give you 25 years purchase—which is the same as 4 per cent.—of your maximum statutory dividend in order to buy your works?—Never. No sum was ever mentioned, except, I think, by the honourable member for Stoke, who, when he saw our late Chairman, spoke about £125,000, which was not at all absurd; but we have from the very first stated most distinctly that it is not our intention to part with any of the works which we have held for half a century.

Whether that be so or not, whatever benefit would accrue by the ordinary process of raising capital by auction, we should lose, because you are a joint-stock company?—That is not so, because we are willing to accept 5 per cent. for this capital, which is a singularly small sum to receive; and when I state that you can buy gas property of the very best description now to pay you 6 per cent. do you think any man would be so beside himself as to lend us money at 4½ per cent.?

It is to say you have raised your own rate at which the capital shall be raised?—No; we are bound to Lord Redesdale's opinion. I explained to his lordship that we could not, from circumstances, accept the auction clauses, and submitted the York case to him, and he thereupon agreed to the Bill being proceeded with.

In our accounts for 1878 there are a few items to which I wish to draw attention.—“Salaries, collectors’ commission, and payments to Directors and Auditors, £1810; professional charges and incidental expenses, £1347 16s. 9d.” That is over £3000 for the year. Are those items charged against the Hanley works by the parent Company?—The charges are made by the accountants in London, and they are down to the Clerk of the Peace, and published in the *Standard* and *Star* journals. I should like here to state that the form of accounts is the most disgraceful which any company could be forced to publish. I protested against it in 1866, but we were forced to adopt it.

I never mind the form of accounts. Is it not the fact that the present joint-stock company does not have anything over £3000 a year as their proportion of general expenses which you yourselves decide upon, which no one in Hanley has the details of, and with respect to which no one has a word to say?—They have power, if they like, to appoint an accountant.

Suppose we did appoint an accountant, would he have a right to go into the accounts of the parent Company, and to have produced the books of the parent Company to us?—I should certainly not produce those books, because they have nothing to do with the matter. We are incorporated by Act of Parliament, and under that Act we work. It would be no use giving you accounts which do not apply to Hanley at all. The items mentioned amount to £1350 per annum, and I have produced the books of the British Gas Company, who are men of very high position, only receive £1000 a year for the labours which they devote to the whole of the stations; and it is nonsense to suppose there is anything unfair charged for Directors fees.

I am not suggesting anything unfair, but I am putting it as a matter in which you charge us what you please, without any means of checking the correctness of it?—We do not charge you what we please. Every account, even to a petty cash entry, is passed by our Auditors, and it is not likely that accounts would be rendered which are inaccurate or dishonest.

Cross-examination continued: At Norwich they have an auditor, who has a right to examine all our books, but I certainly object to the same thing at Hanley. I am aware that the course of legislation of late years has been to transfer gas and water undertakings to the control of the local authority, but it has been by arrangement, and not by compulsion. The Corporation of London were bound to do so in 1877, so that they were not to purchase our works, which measure was opposed by us. The Chairman, in giving the decision of the Committee, said they were of opinion “that the promoters have not proved the preamble of their Bill; but at the same time the Committee wish to express their opinion to the Company that they have given at times very just cause for complaint, both as regards the supply of gas and the want of illuminating power” but I respectfully submitted at the time that that remark was scarcely fair. If we had been allowed to produce our witnesses we should have proved that the charges against us were utterly untrue.

Examined by Mr. JONES: That Bill was thrown out before we called a single witness. Each branch of the Company is under the control of Parliament, and the amount of capital to be expended and dividend to be paid, is defined by the various Acts. If this Bill passes, our accounts will in future be published in the same form as those of the Metropolitan Gas Company. By the Act of 1847 there is power, if the profits are more than the amount prescribed, for the Court of Quarter Sessions, on the petition of any two gas ratepayers within the district, to appoint an accountant to examine the actual condition of the undertaking, and to make a report as to the truth of the accounts.

Mr. BIDDER: That is only after you have paid your maximum dividends and your rates are increased to the extent of 10 per cent. for 25 years.

Re-examination resumed: We have nothing to disguise. What we show at Hull, Norwich, and other places, is shown at the Potteries, but I do not see why we should be placed under different provisions to those which apply to the Gas Companies of the Metropolis.

WEDNESDAY, JUNE 16.

Mr. G. W. Stevenson recalled, and cross-examined by Mr. BIDDER.

I am aware that gas coal can be obtained very close to Hanley, but I do not know the cost of it. I form my judgment as to whether the price charged is proper or not from the statements of account. The quantity of coal used last year was 17,430 tons, and the cost £10,041 4s. 8d. All the neighbouring works are managed by Corporations, and not one of them pays for less than 3s. 6d. If it is the case that at Stoke, besides paying interest, a large sum goes in relief of the rates, it is a very immoral thing to do.

Mr. BIDDER: Is there any reason why, supposing the gas-works were in the hands of the public authorities at Hanley, as good results should not be obtained there as are obtained at Stoke, Burslem, and other places round about? Would it be necessary to charge for the gas at a lower cost, something over £3000 for the expenses of a parent company in London?

Witness: They have to find accountants, collectors, and somebody to act as secretary, so that a portion of that £3000 would have to be paid. Incidental expenses apply as much to the case of a corporation as of a company; and of course there would be a reduction in the item of directors and auditors.

Which would go to the benefit of the consumers ultimately?—I do not know about that; it might go to the benefit of the ratepayers.

They are almost convertible terms?—No; it is the greatest fallacy in the world to suppose that ratepayers are necessarily consumers.

They get the benefit of the public lights if they do not burn gas themselves?—I suppose the consumption of the public lights is one-tenth of the gas consumed.

Can you explain how it is that being limited by Parliament in particular districts to 7½ per cent. as to a portion, and 7 per cent. in some cases, they succeed in dividing among their shareholders 10 per cent. on the whole?—I can only do so in this way—that they have other sources of income beyond the works in the Potteries and at Hull and Norwich. They have two undertakings not controlled by Parliament—viz., Holywell and Trowbridge.

You are aware that the consumers of Hanley have, as soon as the maximum dividend is earned and the arrears of dividend are paid up, the right to a reduction in the price of gas under the present law; do you not think that they have a right to have a distinct intimation knowing that they are not charged with more than is lawfully chargeable against the cost of making the gas and carrying on the works?—Yes.

Do you think it reasonable that the Company should be at liberty to put down what they like for Directors fees, and that the people and Corporation of Hanley should have no control over, or power of checking, it?—I do not think it is reasonable that they should put down what they like, but I think it reasonable that they should act as they do—viz., manage the whole of the concern in London, and charge the proportion of the cost to each place in the ratio of the capital invested. No individual or body has a right to go to the railway directors and say, “Show me your accounts—I want to know whether you are charging what is fair;” and it is the same with a water or a gas company.

The auction clauses being generally applied as a condition to the raising of new capital, is it reasonable that the people of Hanley should be deprived of the benefit of the present law, because the British Gaslight Company happen to have a peculiar constitution?—The consumers of Hanley do practically get the benefit of the auction clauses by the new capital being raised at 5 per cent.

Do you mean that the stock of the Company is not worth more than 5 per cent.?—Not worth more than 5 per cent. It is one thing to buy stock in the London market, and another capital which has yet to earn its dividend—and another thing to buy the stock of a company which is earning its maximum dividend.

If the stock cannot realize in the market more than 20 years purchase, the effect of 25 years purchase of the maximum statutory dividends was exceedingly small. I think not, because the two things are quite different. The offer of capital in the open market to be expended on the undertaking would not realize more than 5 per cent., because it is doubtful whether the capital which is yet to be expended will earn this dividend. There is no doubt about the capital which has been expended, and which already is a secure thing, but the other is uncertain.

Supposing the works were in the hands of the Corporation, they would probably be able to raise the capital at 4½ per cent. *ex sinking-fund*?—*Ex sinking-fund*; but then they have to provide that fund.

In point of fact, if the capital were raised by the Corporation the consumers would gain the benefit to the extent of 3½ per cent.—Not till after 50 years.

Cross-examination continued: I used to express an unhesitating opinion that corporations ought to have possession of both gas and water works, but I have modified my opinion very much in the last 15 years, one reason being that corporations do not have the power of the two things to benefit themselves and the ratepayers at the expense of the consumers of gas. I do not think that gas companies unduly keep up the price. My experience of corporations is that they expend their money on capital account more freely than companies do. There is less difficulty in getting the gas committee of a corporation to spend money than a board of directors.

Mr. BIDDER: You are asking the Committee to sanction £75,000 to bear 5 per cent. interest; therefore if we give them 25 times £5, we should give £125 for every £100 put into the concern?

Witness: Yes; and if they take the £125 to re-invest it they get 4½ per cent. for it, and no more.

You do not agree with Mr. Linging who told us that gas stock could be bought in the market to-day to pay 6 per cent.—Metropolitan gas stock can.

Then for the £100 they put into the concern they get back £125, which they can take into the market and re-invest in Metropolitan gas stock to pay them 4½ 10s. interest?—I cannot see that.

Six per cent. would be £7 10s. on £125; so that they increase their income by all that?—No; besides, Metropolitan gas stock is very fluctuating. A little while ago it could not be bought to pay more than 4 per cent. Then the “scare” came, and it could be bought to pay 7 per cent., but now it is recovering a little, and can be purchased to pay 6 per cent.

Re-examined by Mr. MICHAEL: The Rotherham case is the only one in which the Legislature have granted to a corporation power to acquire a gas undertaking compulsorily, but there was a very good reason for it. The Corporation showed how the company had mismanaged themselves for a long period, and the walls of the committee-room were plastered with test-papers for sulphuretted hydrogen which were as black as a hat. In the event of an inquiry before the Court of Quarter Sessions all the books of the Company relating to the manufacture of gas must be open, under the supervision of the Corporation, and the investigation, moreover, is to be at the expense of the Company.

Mr. CLERK: With regard to the Hanley books, of course we could demand to see them, but not the London books.

Mr. MICHAEL: Any single charge which occurs would be investigated; and if there were any charges occurring for management which are in the books of the Company, all those books must be examined in order to show that those charges are right.

A MEMBER OF THE COMMITTEE said that he was concerned in the Birmingham case, and thought that it was a compulsory transfer. Mr. MICHAEL said that in the case of the gas undertaking, it was by an agreement which had been entered into a year or two previously.

Mr. CLERK said that was the case with regard to the gas, but the water transfer was compulsory.

Mr. MICHAEL said it was *quasi*-compulsory. A clause had been inserted in the old Act of Parliament enabling the Birmingham Corporation to purchase the water undertaking; but it was necessary for fresh powers to be given to the Corporation on account of the money value having risen considerably, and the original powers not being sufficient to enable the Corporation to purchase.

Mr. CLERK recalled, and cross-examined by Mr. CLERK.

The district supplied by the British Gas Company is undetermined, and that causes a large amount of leakage, and reduces the profit. The working expenses are also very much increased by the sums continually being expended in protecting themselves against this leakage—examining pipes, resealing them, and so on. The Company also putting in mains at every proper period, a sum of 2 per cent. which, while it ensures the keeping down of capital, certainly reduces the amount of profit there would otherwise be to divide.

Mr. CLERK: Is that sum actually set aside, or does it merely appear in the accounts?

Witness: It is not actually set aside, but from inquiries I made I consider it a very peculiar item in the accounts. I believe it actually does go in the reduction of the amount of capital spent, and I am told that is the destination of it.

Cross-examination continued: I was not aware that there were only two Shareholders in the British Gas Company residing in Hanley, but any one could become a shareholder by purchasing shares in London, the price being about 4s. or 5s. per share.

Mr. CLERK: Can you tell their localities of any similar case to that of the British Gas Company, being in the possession of gas-works over different parts of the country with which they are utterly unconnected?

Witness: I am not aware that there is, but I do know that all the places supplied by the British Gas Company are supplied at a very low price. In Hull the price is 6s. 6d. per ton, and in London it is 10s. 6d. per ton; and wherever that is the case I believe the Company have a strong desire—perhaps from the peculiarity of their position—to stand well with their customers.

Examined by Mr. MICHAEL: I have looked over the accounts of the Company, and having regard to the amount of business done, I cannot see that any of the charges are in excess of what they ought to be in a well-conducted gas company. The ordinary plan adopted by gas companies is for any expense incurred for replacement of old stock to be charged to revenue, and anything new to be charged to capital.

Mr. Robert Paulson Spies, examined by Mr. JEVNE.

I have examined the gas-works of the Company, and consider the space so confined that the works cannot be carried on so economically as they could be if there were more room, and to some extent this is prejudicial to the production of gas. I have never seen works where greater economy was practised or more intelligence displayed in the mode of conducting the business. Even in the case of the London Gas Company, which has been overcoming the difficulty of their position—coals are lifted by steam engines from barges on to a little tramway, and then run along and dropped down into the furnaces. There is no coal store, but the coals are used from hand to mouth. It is a matter of great inconvenience to the manager and waste to carry on the works in such a way, but nothing can be more economical than their mode of doing it. The time has now arrived when it is absolutely indispensable that the Company should have additional ground close by, on which to build new or supplementary works; and I think they are specially fortunate in being able to secure the proposed site. The capital to carry out the works required without further capital, and certainly they ask for much less than is usually applied for when companies come to Parliament.

Cross-examined by Mr. CLERK: I have not looked at the history of the Company or their Acts; I have merely looked at the state of the case as regards their manufacturing power and the new land. I have not regarded their accounts as they do not do it, and I have no general practice, enable my head about population in connection with the gas undertakings. It may be that a large population will require a comparatively small gas supply, and a smaller population not far off may require a proportionately larger gas supply. The supposition that any population would remain constant for 20 or 25 years is a very rare occurrence. I take the population throughout the country, and the normal rate of increase as being doubled in nine years, or perhaps in less. Without any increase in population I have known a considerable increase in the gas supply, through its being cheaper in price, and being used for so many more purposes than formerly.

Mr. Harry Edward Jones, examined by Mr. JEVNE.

I have been for many years practically acquainted with the construction and management of gas-works.

The CHAIRMAN inquired if the same ground was to be gone over again.

Mr. JEVNE said he would only examine on one point.

Examination resumed: The Company's district is supplied satisfactorily throughout, and with moderate initial pressure, showing that the distributing plant is in good order. The works are conducted in the best way, and are well adapted for supplying good gas in abundance, and I never saw works on the same scale as the Company's, which are producing gas. The only defect is the great want of gasholder room, which the Company must increase shortly if they are to comply with the compulsory provisions they are in to deal with the growth of their business. The capital expenditure of the company works out to £470 per million feet of gas per annum, which is little over the usual proportion of capital to business done, and shows that the greatest economy has been practised in the administration of the capital account of the Company. I think the increase of capital asked for is fair.

Cross-examined by Mr. CLERK: I tested the gas for sulphuretted hydrogen and ammonia, and found it pure.

Mr. CLERK: You have said that the price of £470 per million feet was low; is not that accounted for by charging 2 per cent. for the depreciation fund, and expending that upon the restoration of the plant?

Witness: I am not able to say how low 2 per cent. has been charged. We are told since the year 1868—I do not think that within that period it could have endured so much to the benefit of the Company as the figures show.

Mr. Robert Linging, examined by Mr. JEVNE.

I have been Manager of the British Gas Company's works at the Potteries since the year 1875, and before that time was Assistant Manager of their works at Hull. With my experience I am able to give a further extension of land and a new gasholder are particularly required. We find very great difficulty as to the sale of coke, arising from the want of storage room for it. In 1877 we sold 83 per cent. at 5s. 2d. a ton, long weight; in 1878, 60 per cent. at 4s. 10d. a ton; in 1879, 40 per cent. at 2s. 7d.

The CHAIRMAN said he thought these facts might be taken as admitted, there being no dispute about them.

Examination resumed: I quite agree with what has been said as to the Hanley district being peculiarly difficult to supply, owing to the condition of the ground. On an average for the last five years the leakage has been about 14 per cent., while at Hull it has been only 8 per cent. We have had 266 mains broken during the last four years, and between 900 and 1000 joints drawn, which is an unusual amount. Since 1877 we have had no complaints from the Corporation respecting the purity and illuminating power of the gas.

Cross-examined by Mr. CLERK: The land proposed to be occupied has been held by trustees connected with the Company for many years past, but I do not know whether any interest has been paid for the purchase. Our mains at the present time extend throughout almost the whole of the ground, but where new streets are formed we have to lay down new mains. In 1879 we had 415 consumers in Hanley, and 1829 in Tunstall. The districts are supplied from separate works, the sale of gas in the former last year being 192,000,000 cubic feet, and in the latter 29,166,000 cubic feet. The percentage of leakage of gas in Tunstall was only 6.47 during the year ending June, 1879, and 6.19 for that ending December. The loss by leakage during the year ending June, 1879, was 13.41 per cent. The difference between the gas made and that sold was about 8 million

feet, or 6 per cent. In 1878 the gas made at Hanley was 197 millions, but I have not the figures here for the gas sold. The amount of gas consumed on the works is all registered, and is not included in the "unaccounted for gas." The leakage at Brownhills for the year 1876 was nearly 23 per cent., but we had a great number of broken mains at that time, owing to mining operations. Since that time we have used the same material, and made them stronger, and the district is now more looked after. The price of coal in 1879 was 11s. 7d. per ton delivered into the works. It was unscreened coal from the Frognore Hall Collieries. It is delivered from the railway on to the canal, and then into the works. I am not aware that the same coal is delivered at Burnley for 5s. 4d.; but the railway runs directly into the works there. Our contract was entered into two years back, and will expire in about a month's time, to my recollection. If we were to make a fresh contract, it would be considerably cheaper, and that would diminish the cost of manufacture. We sell our tar for about 21d. per gallon, or 1s. per barrel; but the same chemical liquor we manufacture into sulphate of ammonia at the Tunstall works, and I consider that to be a profitable business, although I cannot tell the actual profit, as the accounts are made out in London. The burner employed at Hanley for testing the illuminating power of the gas should be 14-hole brass gas-burner; but the tester invariably uses the "London" Argand burner, which is a superior burner, but does not improve the gas in any way. The cost of erecting the sulphate of ammonia works at Tunstall was about £800, but I do not know where the money was found for that purpose. When we are going to lay mains we do not give notice to the Corporation that we are going to take up the streets, because I think no notice is required.

Re-examined by Mr. JEVNE: The contract for our tar at 42s. was made three years ago, but we have reduced that contract 2s. per ton to the end of December, owing to the bad trade. Owing to our want of space, we have to get rid of our coke at a sacrifice. We are not near any railway, and have to send our coke to Birmingham by the Great Northern.

A MEMBER OF THE COMMITTEE: What becomes of the gas that is not sold?

Mr. JEVNE: It leaks out through the mains and joints, and is wasted in a variety of ways; and there is the condensation also.

Re-examined by Mr. CLERK: There has been a decrease in Tunstall from 36,567,500 feet in 1876 to 31 million feet in 1879, but that is owing to the bad trade of the last four or five years.

Mr. JEVNE: The leakage has decreased during those years.

A MEMBER OF THE COMMITTEE: Those Tunstall works must be struck out of the account in the estimate for an increased supply, because there is not an increase, but a decrease there.

Mr. JEVNE: But there the question of leakage comes in. A less amount goes out, but then it nearly all reaches the consumers; in other words, the less leakage the less gas need be made in order to supply the same quantity. It can be proved, if necessary, that the quantity sold in Brownhills during those years was nearly as much as in Tunstall.

Mr. Miles Knowles, examined by Mr. JEVNE.

I reside at Tunstall, and am a Chemist and Teacher of Chemistry. In October, 1879, I was appointed by the British Gaslight Company to test their gas, and produce the results of the same. In November, 1879, the Burnley and Brownhills works were closed. On 20th January, 1880, on 23rd February, 1880; March, 14th; and April, 15th. The average of sulphur for November, 1879, was 12.7 grains; December, 16.04; January, 1880, 11.53; February, 19.51; March, 14.09; and April, 14.59. I have only once found the illuminating power less than 14 candles, and that was on March 19 of this year. It was 13.92 at that occasion, but I afterwards found it arose from an escape in the pipe after passing the meter. On two occasions only did I find the sulphur exceed 20 grains—Dec. 23, 1879, when it was 23.7; and March 23, 1880, when it was 22.74. The tests were made at the offices of the Company in Pall Mall, Hanley.

Cross-examined by Mr. CLERK: My mode of testing is to allow the gas to pass through a meter, which registers it, and then it is consumed at the burner at the rate of half a foot per hour under a glass trumpet-shaped tube, the upper portion of which is connected with an *épreuve* containing glass marbles, which enlarge the surface over which the consumed gas has to pass, and the burner is placed over the top of the tube. The ammonia, the vapour from which combines with the carbonic acid and the sulphuric anhydride to form carbonate of ammonia and sulphate of ammonia. Any vapours which will liquify are condensed on the marbles, and run into a small glass vessel placed below. I have not tested for ammonia, but I have tested for sulphur. The Burnley and Brownhills works of the gas being only 13.92 candles, the Borough Analyst was with me, testing for the Corporation, and we both discovered there was an escape.

Re-examined by Mr. JEVNE: The apparatus used for sulphur testing was the one used by the Borough Analyst, and never objected to; and the one also employed by a special gentleman sent down from London—Mr. Foster, who likewise did not object to it.

By the COMMITTEE: The presence of ammonia in gas would be injurious in any large quantity; but we know that gas companies now are rather anxious not to allow any ammonia to pass, as they make a profit out of it.

Mr. JEVNE said this was the case for the promoters.

Mr. CLERK, in addressing the Committee on behalf of the Corporation, asked their lordships not to proceed further with the Bill. The unique character of the British Gas Company had been more than once admitted during the progress of the Bill. They had before them a company established by deed in the year 1824, at a time when gas was in its infancy, and when nobody knew whether it would be a profitable speculation. They were not established by an Act of Parliament, but by a deed of association among themselves, under which they continued for a number of years; and it was not till the year 1856 or 1857 that they became a registered company for the purpose of carrying on business. Under the large and indefinite powers which they had, they undertook to supply gas to a great number of places, and no doubt, very beneficially at that time, because, 56 years ago, everybody was much interested as to the mode of carrying on the manufacture of gas. In 1826 they took up the supply not only of Hanley and Tunstall, but also of Stoke, what was now in the district of London, the district of Burnley, and the great power in the Potteries district. Most of these districts by degrees passed away into the hands of local gas companies, and were subsequently transferred by Acts of Parliament to different local authorities or corporations; and now Hanley and the adjoining small district of Tunstall alone remained, in that neighbourhood, under the control of the specially constituted British Gas Company, although they still retained the power of manufacturing gas at Hull, Norwich, and Trowbridge. Supposing it were the case of an ordinary gas company, which had been in existence for a good many years, applying for an increase of powers for manufacturing gas, the local authority might come forward and say, "We will not give you the powers, because they should be transferred to the Corporation, but that the Corporation should be paid a fair sum for what they had laid out, and he thought the recent decisions of Parliament justified such an application. But the parties stood in a most extraordinary position in the present case, because the British Gas Company had been in possession of the district, with the consent of the borough of Hanley, and the gas supply for a number of years. In 1877 the Corporation introduced a Bill

for the purchase of the Gas Company, but without success, on the ground that it was not usual to exert such powers of transfer except the Company were asking for fresh powers. Was there ever a more extraordinary thing than that of the Company coming and asking for an enormous increase of capital, which was absolutely unnecessary, and for which there was no justification? The Company had supplied gas at the same price as the towns of Stoke and Burslem were charging, and yet they said they could not earn their statutory dividends, and also that there was a deficit in June last of between £11,000 and £12,000 which they were entitled to as dividends, but strange to say during all this time the adjoining districts had been making sufficient profit out of the same price to pay their statutory dividends. The parent Company had also, during all the time, been paying 10 per cent. to their Shareholders, and the Corporation said, "Let us know now that has arisen. You have the books in London which show the whole management; show us the way in which the profits are made." "No," they said; "you shall only see what we pay for coal, the cost of manufacturing, directors' fees, and so forth." But there must be a great deal undisclosed in the books kept in the London house. At Hill they only charged 2s. 6d. for gas, and Hill was not situated as far as dividends as five miles of the coal-fields, like Hanley, but they had to carry their coal 50 or 60 miles. As a matter of fact, the land proposed to be acquired by the Company was already in their possession, and had been so for a number of years, and had been paid for.

Mr. JENKINS said that was not the case.

THE CHAIRMAN inquired whether the Company had used the land.

Mr. JENKINS said they had not.

Mr. CLERK said he should be able to show they had been in possession of the land for a number of years. The Corporation were ready to give the Company 25 years purchase of their main statutory dividend, and he asked for their lordships whether they did not intend to make a similar offer. The whole area of the Company was 17 acres, and the greater part was built over. For some years past the works had been perfectly stationary, and since 1876 there had been a decrease instead of an increase in the amount of gas produced. Under these circumstances he asked their lordships if the Corporation had to ask for such an enormous additional capital as they now applied for. He also pointed out that the people of Hanley knew nothing of the expenses apportioned to Hanley, and had no power of ascertaining whether those charges were correct or not. In conclusion, he expressed a hope that their lordships would proceed to the Bill without limiting the capital, and also providing for the transfer of the works to the Corporation of Hanley upon reasonable terms.

Mr. John Bromley, examined by Mr. CLERK.

I am the Mayor of Hanley, and have been a member of the Corporation since 1873. The population of the borough in 1871, the population is estimated at 50,000. There has been a very strong feeling in Hanley for a long time past with reference to the possession of the gas-works by the Corporation. The whole of the ratepayers are not direct consumers, but they all participate in the consumption of gas, because the ratepayers have to pay the Corporation the amount for lighting the streets. The present Bill was brought under the notice of the Town Council on November 10 last, when the Town Clerk was requested to inquire whether the Directors of the Company would be inclined to treat for the sale of the works, to which a reply was received that the Directors had no intention to part with the works. Under the circumstances the Corporation called for the purpose, a resolution to oppose the Bill was carried with only one dissentient. The Corporation pay £2100 for lighting the streets and public buildings.

Cross-examined by Mr. JENKINS: The number of inhabitants I have given has nothing to do with the size of the borough, but simply with the borough as I am not aware whether the limits of the Etruria works extend outside the borough. We think it would be better for the supply of gas to be in the hands of the Corporation than of a private Company.

Mr. JENKINS: That is a little vague. Why better?

Mr. JENKINS: Because our neighbours are coming in with it.

That again is vague. What good do you expect to get if you are allowed to purchase these works?—The general feeling is that we should get more advantages than we have at present.

That also is a vague reason on which to come to Parliament and confer upon property which you do not control. In 1871, the Corporation was not then. Then what advantages do you propose to get?—We should not have a private company interfering with our streets, and cutting them up in the way they do at the present time, and that is a very sore point with the Corporation. In several cases in my own experience, the moment we made an appeal and called in a private company, the gas-works in the borough of Hanley we have found it cut up, and it is very much to the disadvantage of the ratepayers, in my opinion. It is being done now in the principal thoroughfare into the borough. Two years ago that road was cut up by the Water Company, and has been dangerous ever since; and now when we were just getting it into something like decent order, the Gas Company are going down the same road.

Do you not suppose that the Corporation would have to open the streets if they made the gas themselves?—We should have better sense than to open them just after we had made them. I do not say that the Gas Company would do this unnecessarily, but I do say that they do not consult the interests of the ratepayers.

Would it not have been more to their interest, when the street was opened, if they could have done so, to have put down their pipes, and have saved the expense of opening and replacing?—I do not suppose the Water Company would have let them lay down their pipes at the same time.

Cross-examination continued: I could not say that the Gas Company ever opened the streets unnecessarily. I believe if we had the concern we should manage it differently. At Stoke matters are arranged very well, so that every man gets a profit to the ratepayers, but I have not been into the figures.

Mr. JENKINS: What is it that you suggest that more money is spent upon at Hanley than need be spent?

Witness: I cannot say.

Do you think that, somehow or other, you are going to make more money?—I think so.

It is the interest of the Gas Company to make as much money as they can out of their works?—No doubt.

They have had great experience, with their five stations, for a very many years?—Yes.

And yet you think that you, with no experience, taking the matter up for the first time, are going to do the thing much cheaper?—Yes.

Re-examined by Mr. CLERK: Both at Stoke and Burslem, since they have been detached from the British Gas Company, a deficit has been occurring into the streets, and there is no reason why the same should not be the case at Hanley. When the Corporation had to alter or re-met a street they would take care that any alteration to the gas-pipes would be done at the same time.

Mr. Henry Woodall, examined by Mr. CLERK.

I am Manager of the Leeds and Colne Water Works. I am aware that I was ten years at Burslem and two at Loughton. There is no difference in the

character of those districts and Hanley, mining going on more or less. I have seen the proposed Bill, and do not consider the capital asked for is required, because I find that the capital of the Company does not augment in the same ratio as the increase of business. My experience at Leeds is very decided upon this point, because prior to 1870 the Companies had expended £600 for every million feet sold per annum, but since I went to Leeds, in 1875, the expenditure upon the increase of business has been at the rate of £282 only, or less than one-half of what it was ten years ago. The same ratio at Leeds is a very contracted one. My property is a thing now so perfectly well understood that the risks can be thoroughly appreciated, as is proved by the conduct of this Company in accepting 5 per cent. as the rate of dividend. As proof that £75,000 is not required in this case I may mention that during the time I was at Burslem I think for the last six years of my management there was no addition whatever made to the capital account; the whole additions to the business were made out of the revenues of the period. I have left there five years now, and there has not been an addition to the capital account during the whole of that time. I should say about £30,000 would be quite sufficient. I think that the price fixed by the Act of 1858—3s. 6d., which is the maximum now charged—is very high, and the proof of this is that in 1871 and 1872 the same Company sold gas as low as 3s. If they could sell at that figure then, it should certainly be lower now, because they have not added to their capital account proportionately, and all the residuals, with the exception of coke, sell for higher prices than were ever prevalent in the district. In addition to this, they have had a very large increase in business. I cannot tell how it is, with a price of 3s. 6d., they cannot make their full dividends. Their management seems to me to be very thrifless, because I have gone most carefully into the accounts, and my estimate is that gas should be made and sold there for 2s. 6d. per 1000 feet, and that the surrounding districts, where they only paid enormous premiums for the works, but they hand over a sum of £2000 a year for reduction of rates. It appears to me that the British Company are at a great disadvantage in not having resident directors. It has been given in evidence that they are paying 7s. 7d. per ton of coke, and I know that the same Company have purchased of the same quality at 8s. 4d. in Burslem. We have been told that the contract dates back two or three years, but that shows the want of prescience on the part of the Directors to have bought so far ahead as they did in a falling market. Directors who are residents are often more careful in the management of the works, and they have no interest in their interest lies in reducing the price of gas. Some years before I left Burslem I thought there was a good thing to be made out of a transfer of the works to the Burslem Company, and endeavoured to open negotiations with that object, but they did not come to anything. When the Burslem Company were asked to buy the works, they refused to do so, and the exclusive possession of the whole field, and there can be no doubt that if they had been sufficiently enterprising they would have retained possession of the district to this day. As the districts were separated from the parent source of supply, they established works of their own, and they have all been conducted at an average of more than 4s. per 1000 feet. The dividends in the years 1870-71-72-73, or four years out of 14. Without going minutely into the statement, I may say that there is a difference of economy in comparison with Burslem of 672d. per 1000 feet. There is not the slightest advantage in the situation of Burslem with reference to getting cheaper gas. Under the circumstances, the net profit we made were supplied from the same colliery. When supplied from the North there was a slight disadvantage to us; but if supplied from the South there would be a similar advantage to Hanley. When I first went to Leeds the price was 3s. 9d. per 1000, with a discount of 2d. Since that time it has been reduced at an average of more than 1s. per 1000 feet, and the present price is 2s. 2d., but I anticipate that on July 1 next it will again be reduced to 1s. 10d. From my knowledge of the Potteries district I will undertake to give up my situation at Leeds and take the management at Hanley, and my dividends should be solely dependent upon my realizing maximum income at 2s. 4d. per 1000 feet, or a reduction of 1s. 2d. upon the present price.

Cross-examined by Mr. MICHAEL: The quantity of gas made at Leeds is 1350 million feet, but I do not think the quantity makes any difference. The price charged in London varies from 3s. to 3s. 6d. I have never seen a Company that has sold more than 1000 million feet, and the present price is 2s. 2d., but I anticipate that on July 1 next it will again be reduced to 1s. 10d. From my knowledge of the Potteries district I will undertake to give up my situation at Leeds and take the management at Hanley, and my dividends should be solely dependent upon my realizing maximum income at 2s. 4d. per 1000 feet, or a reduction of 1s. 2d. upon the present price.

Witness: It is a great pity they are not. As to the comparison between Leeds and Hanley, I think you have stated that gas is cheaply as I did in the smallest works ever managed—Loughton. There was a question between me and the Manager at Stoke, as to one halfpenny per 1000 feet, but I do not know who was the victor. One delivered gas into the holder at 51d. and the other at 6d., but I have never been able to do so at Leeds for 51d. I am a little at variance with engineers of other gas-works.

Have you looked at the price for coke obtained by this Company? In 1873 they obtained 17s. 3d., and in 1874 16s., as against 2s. 9d. in 1879—Whereas in Hanley in 1873 they appear to have been selling coke at 17s. 3d., the Burslem Company were realizing 21s., and therefore I say that this Company were not only buying coals too dear, but selling residuals too cheap.

Cross-examination continued: In Burslem the examination for sulphur was a rigid one, and the Company there were in advance in their efforts to get rid of it of any company outside London.

Mr. MICHAEL: How do you make that out of the 4d., which is to produce the statement, and the dividend which you are going to earn?

Witness: I have made an estimate for 1881, and have taken the Company's statement that they will increase at the rate of 5 per cent., although I have no doubt that when they get a new gasholder and reduce the price they will have more than 5 per cent. increase. The average of the coal at producing 9203 feet per ton, but 9500 is a common average in the district. I take 20,478 tons to produce the quantity of gas required, and I estimate that coal will cost 9s. per ton. I allow 15 per cent. for leakage, which is double the actual rate as given in evidence; I deduct residuals, coke per ton of 9s. 10d. per ton of coal, and I add 1s. 6d. for the cost of Purification. I have reckoned at 1d. per 1000 feet of gas manufactured, while at Leeds it is not costing as much as 4d.; wages, 4d. per 1000 feet, upon the supposition that they pay 85s. per week to the stokers, but I do not think they pay so much. Repairs and maintenance of works are put down at 9d.; at Leeds it is 4d. per 1000 feet. The Company's actual expenditure has not been so much. Salaries and collection, 2d. per ton,

or three times before finding the Manager, and were then told the Company would attend to it, which they did the next day but one, and the light was good after that time. I have no recollection of the Manager saying the defect was owing to a stoppage in our own fittings; I think it was in the pipes in the main road.

Mr. Pope read the report of the inspector, stating that the cause of complaint was water in one of the fittings.

Witness said he never knew such was the case; it was the first time he had heard of it.

Mr. William Foster, examined by Mr. BIDDEN.

I am a Fellow of the Chemical Society, and also of the Institute of Chemistry, and have been for 24 years Gas Examiner for the Metropolitan Board of Works. I went to Hanley on May 14 to ascertain the illuminating power and purity of the gas supplied there. The burner I found at the testing station corresponded in every respect to the statette "London." Argand burner, but did not at the time observe it was the burner in use. I made some observations, and recorded one of the illuminating power, and also commenced other observations with regard to the purity of the gas. Later on I had with me a standard burner as prescribed by the Company's Act and on asking for a similar one from the authorities at the station, I found there was not one. I went to the office a little before 6 o'clock in the afternoon, and was there during the greater part of the time between then and 12 at night. An observation with the statette "London" burner about half-past 5 gave an illuminating power of 131 candles. Later on I used the parliamentary burner I had with me, and also recorded the illuminating power of the same burner. I also tested with the parliamentary burner, and obtained an illuminating power of 17 candles. I may here observe that I could not use the statette Argand burner found at the station; the quality of the gas was such that it would not permit of its being tested by that burner. At 10.40 I again recorded observations, which gave an illuminating power of 140 candles. I also tested for sulphur, using the apparatus employed at the official testing station of the Company, and known as the Gas Referees sulphur-testing apparatus. The quantity of gas consumed was 3.29 cubic feet, which is at the rate of 1 1/2 cubic foot per hour, and I found 4.68 grains of sulphur per cubic foot of gas consumed, which is a large quantity relatively to what is found in the London gas at the present time, where it is limited to 20 grains per 100 feet. The Hanley Company's Act of 1866 also limits it to 20 grains. I made a determination of the ammonia impurity, not in the official testing-station of the Company, but in the offices of the Corporation, which are opposite the No. 125 station, and I found in 24 grains, the maximum allowed by the Company's Act being 5 grains.

Cross-examined by Mr. POPE: Every testing operation requires care and diligence. The Manager did not point out to me that the test with the burner I found there must be imperfect because the cone was left off. I did not know that I took anything off, or left anything off; I found the burner in use. I did not use a common burner, but one of the official type. The quantity of sulphur depends on the method of purification adopted in these small places. I did not try Burslem, nor Stoke, nor any of the other places around, and for anything I know it might have been worse in those districts.

Reinforced by Mr. BIDDEN: Most of my experiments were made with the parliamentary burner, quite irrespective of whether I made any mistake with regard to the burner I found in use. I merely speak as to facts when I say the gas was much richer in the later part of the evening than it was in the earlier.

Mr. BIDDEN: I suppose it was known you were there testing the gas?

Witness: Yes; and the officials were not favourable to my going into the station.

A MEMBER OF THE COMMITTEE: If their storeage does not extend to more than 24 hours, it occurs to me that it would be possible to make gas to reach a few thousand yards off in a few hours. Would a deficiency of storeage make the quality of the illuminating power vary much in a short interval?

Witness: I think not. If storeage is detrimental in a serious degree to the quality of the gas, there would be very bad gas in London, where it comes from Burslem, many miles off, and where it must be made some hours before it is consumed.

Mr. Henry William Ackrill, examined by Mr. GREENE.

I am Clerk to the Local Board of Tunstall, which is supplied with gas by the British Gaslight Company from the Brownhills works. The Tunstall Local Board is glad to purchase the gas works if the Gas Company would sell them, and they are supported in their view by public opinion.

Cross-examined by Mr. POPE: We should object to being supplied by Hanley if the Corporation there obtained the works; and it is agreed that, if they buy, we should be glad to purchase the works if the Gas Company would sell them, and they are supported in their view by public opinion.

A MEMBER OF THE COMMITTEE: You are a solicitor, and have a good acquaintance with the rudiments of justice. Do you think it a just thing for a public body to come and take, *ex arbitrio*, from private companies their property which they have held for a long time?

Witness: We should be glad to have it, but I do not say it would be just to take it if they do not wish to sell it.

Mr. Ralph Hamersley, examined by Mr. GREENE.

I am Chief Bailiff of Tunstall, and have been deputed to appear here to support the petition of the Hanley Corporation against this Bill. The Local Board of Tunstall is between the 900 and 1,400. At a meeting of the Local Board of Tunstall, on March 8, it was unanimously thought that if we could get the supply of gas into our own possession it would be much better for the consumers and the ratepayers, as we could supply ourselves much more economically, both individually and for the public service, inasmuch as since 1861 we have not had any reduction in the price of coals, which are now 40 or 50 per cent. cheaper than they were then, while we are paying the same for our public lights.

[The witness was not cross-examined.]

Mr. George Turner, examined by Mr. BIDDEN.

I am the Mayor of Stoke, and for the last 40 years I have taken a great interest in all matters connected with the welfare of that town. Up to a certain time Stoke was supplied from works belonging to the British Gas Company, but those works were acquired by the Stoke, Fenton, and Hanley Gas Company, and subsequently by the Corporation, into whose hands they came about 20 months ago. We bought undertaking upon a 25 years purchase of the maximum statutory dividends, which was all at 10 per cent. The amount more than represented the value of the Company, because it covered all they could possibly get out of it, and much more economical than that of the Company, because we save in general expenses of management, directors fees, and so on, and I think we may put that down at £500 per annum. We raised the money for the purchase at 44 per cent. Our first year's experience resulted in paying £200,000 of the £287,000 we borrowed—that was £85,000 for the purchase of the works and £200,000 for the expenses of the Act, &c.—and enabling us to put by a portion for the repayment—

Mr. POPE: That was 1 per cent, I suppose?

Witness: At present we have not decided what form we shall adopt. We are allowed four years from the passing of the Act before we decide

whether we shall pay it by a sinking-fund, or by a repayment of principal and interest by annual payments. We have, however, decided that during these four years of grace we will reduce the amount by £2000, so that at the expiration of the time we shall simply have to meet the liability of the £85,000. We have also been able to divide between the Stoke, Fenton, and Hanley Gas Company, the latter being joint purchasers with us—£3750 as clear profit. Of that amount Stoke participates to the extent of £2600, all of which has gone to the reduction of rates. We pay 7s. a ton for our coal.

Mr. POPE said it was not the same coal as was used at Hanley.

Witness: I would say, in reply, that the results of our coal are, I think, satisfactory. From 1876 to 1879 we had a contract at 7s. 6d. per ton, and when that expired we applied to different coal proprietors for a supply, and received many tenders for burgy, which is an unscreened coal used in many gas-works. The highest tender we received was 7s. 3d., I believe, and the Hanley Company have since paying 11s. 3d. I have a weekly statement sent to me of the make of gas and the results per ton of coal. The make for the week ending June 5 last was 9810 feet per ton, and for the week ending June 12, 9900 feet. The make at Hanley was 9300 feet, so we get from 500 to 600 feet more gas per ton of coal. When the Stoke Corporation took the matter in hand, they found that other gas-works were realizing better results, and they insisted upon that that better results should be realized there, and the return for the last year by the Manager showed that the make of gas averaged 9900 feet. We obtain 6s. a ton for our coke, and when I was at the works last week there was no coke at all. During the week ending June 12, 1879, I do not think we got 6s., but I do not think we sold any for less than 5s. This shows that the Hanley Company were losing a revenue of 2s. 3d. a ton as compared with what we were realizing upon our coke. In 1879 our coal cost £2393 10s. 10d., and our residual products realized £3161 1s. 1d., or within £220 of the actual cost of the coal.

Mr. BIDDEN: I see by the Hanley accounts for 1879 that they paid £10,000 odd for their coals, and only realized £4458—or less than half—for their residual products?

Witness: I do not know anything about that, but I can only say if it was the Stoke we should speedily take it.

Cross-examined by Mr. POPE: We purchased the gas-works at Stoke by agreement.

Mr. POPE: I understand that your gas profits go in reduction of the general rates—that is, you put your hands into the pockets of the gas consumers to reduce the general ratepayers.

Witness: I should say that we do a general good instead of doing a partial good.

But so far as the consumers and ratepayers are not the same people, you relieve the one at the expense of the other?—But they are the same people, in some degree.

Mr. Thomas Hulme, examined by Mr. GREENE.

I am a Member of the Town Council of the Borough of Burslem, and have been twice Mayor. I am also Vice-Chairman of the Gas Committee of Burslem, the population of which is about 30,000. Up to 1877 the supply of gas was in the hands of the Burslem and Tunstall Gas Company, which had previously purchased the right of the British Gas Company. The capital of the Burslem Company was £36,000; the illuminating power of the gas was the same as that supplied to Hanley and Tunstall, and the price was also 3s. 6d. per 1000. The Burslem Company were likewise paying their statutory dividends of 10 and 7 1/2 per cent. Since the Corporation have taken over the coal, the cost has been very satisfactory. We have not reduced the price of gas, but we have reduced the public rates; at least the Council have accepted an offer to light for the whole year, instead of ten months. We have also increased the illuminating power of the gas, which is now 10 candles instead of 14, and the sum of £3700 has been handed over to the fund in aid of the rates during the last two years. We have also applied £3918 to the formation of a working capital. I cannot see any necessity for the large increase of capital asked for by the British Gas Company; we work ours with a very trifling capital at the present time. The former Company had £36,000, and the £3700, which now forms our capital went into the pockets of the Gas Company.

Cross-examined by Mr. POPE: I am aware that, so far as power to purchase by agreement is concerned, the Local Government Act of 1865 gives all that power.

Witness: A purchase by agreement is one thing, but putting your hand upon a man's property and compelling him to sell is another.

Witness: Certainly.

By the COMMITTEE: We have considered the propriety of reducing the price of gas to the consumers, but we consider that until we get sufficient business to consider ours over to the fund in aid of the rates we give £2000 in aid of reducing the rates, which was equal to reducing the price of gas to 2s. 11d. The works are owned by the public, and whatever profits are made it is, of course, proper that the public should reap the benefit of them.

Mr. Matthew Folliott Blakiston, examined by Mr. BIDDEN.

I am at the present time a Solicitor at Stafford, but until 1873 I was Town Clerk of Hanley. In my judgment it is expedient and desirable that the gas-works at Hanley should be in the hands of the Corporation. From my experience at Stafford I should anticipate better results at Hanley than even at Stafford, because the latter was a local company. I believe the Corporation of Stafford obtained the right of the British Gas Company for the purchase of the Gas Company without any previous arrangement with them, and those powers were put in force. The Act gave us power to purchase compulsorily at any time within seven years, upon giving notice to the Company of our intention to do so, and the price was to be fixed by arbitration under the Railway Clauses Act, which is different from the Lands Clauses Act. We did not exercise the power at once, having a good many things in hand, but the Gas Company gave notice of an application to the Board of Trade to sanction the issue of £15,000 more capital. We had it then, and we thought it would be better to have it put it back at a premium and the Corporation then decided to purchase the works, and served the necessary notices. No agreement was arrived at, and the matter went to arbitration, when an award was made, which has been in operation for over two years. It appears to me that, having regard to the fact that the Corporation of the Hanley Gas Company, if the Committee should pass this Bill, it should be subject to more stringent conditions, for it practically takes away from the Corporation the chance of acquiring this property. The great mass of our loan in Stafford was raised locally, and we pay 4 per cent. net, which is equal to about 4 1/2 s. Supposing Hanley do the same, it would be similar to the application to raise £750,000 at 5 per cent. in effect, more to the consumers of that town to the extent of 1 per cent. If the Corporation should hereafter obtain powers to make terms for the purchase of the works, they would have to buy back the whole of this capital, whether it had been raised or not, and they should be obliged to pay for the whole of it.

Mr. BIDDEN: If the Committee sanction the £750,000 capital, and the works were bought the next day, the very fact of the capital having been sanctioned, though not a penny had been issued, would be the foundation of a substantial claim for compensation?

Witness: For about £18,000.

Examination continued: Stafford had been exceptionally fortunate as regards management, which has been local, and very economical. It is essentially the case, in a place like the Potteries, that consumers and ratepayers are identical. Of course, ratepayers are consumers in respect of the large consumption of gas in the public lamps, and the small ratepayers are consumers in respect of a large consumption of gas in their own homes, and in many places they are actually charged for the gas they use. If they do not burn it in their own homes, they burn it necessarily in the occupations they carry on in the town.

Mr. BAKER: Carrying it a step further, if they were not identical, in point of fact the more you are able to apply in the reduction of rates, is partly acquired by being able to raise money at a low rate of interest upon the security of the rates, and, therefore, the surplus is justly applicable to the relief of the ratepayers?

Witness: I cannot at all agree with Mr. Stevenson that we are acting imprudently in this way.

Will you point out in what respect economy would be possible in Hanley by the Corporation taking over the gas-works?—I think in every respect. The Corporation have no directors fees to pay to any officials, because there must necessarily be a staff of engineers, accountants, and clerks, all of whom can be brought to bear upon the gas department, which would then be worked as a branch. The rates can also be collected by the people who collect the district rates with a very slightly increased payment; and in a district like Hanley there would be a very great economy in respect of the direct supervision of the Council and the ratepayers. There is also the advantage that while the Corporation have control of the gas they are most liberal with the public light, they do not think about the cost as if they had to pay so much for each light. There is likewise a manifest advantage in regard to the streets, because when the pipes are in the hands of one authority, who have charge of gas, water, and sewers, they are able to have a little destruction of the streets as possible. If the additional capital proposed is subscribed for, no need to pay to the effect will be to keep the Company out of Parliament all that time, and the Hanley people would not have the advantage of obtaining concessions from them.

Cross-examined by Mr. POPE: A compulsory power of purchase was inserted in our Improvement Bill, and the Gas Company seeing it there, did not even petition against it. They could see that the Corporation had better have the works, and they did not think it worth while to contest the matter, but said they would take a clause that would give them full compensation.

This concluded the case for the opponents of the Bill.

Mr. POPE, in replying upon the whole case, said he had never known an instance of a gas or water company applying to Parliament for increased powers, in which the local authority of the district had not interfered and said they were the parties who ought to take the supply of those useful articles. If they were determined to take the case, in the first instance, it might be worth while for Parliament to consider whether the public authorities were not the parties who ought to assume such responsibilities; but it was curious to observe that they were only anxious to take possession of the works so soon as they became profitable. This, however, was not the case, and the authorities, with the power of seizing such property simply because they thought it would be better administered by themselves. With the exception of two cases—the Stockton and Middlesbrough Water and the Birmingham Water Bills—not a single instance could be found in which Parliament had sanctioned the seizure of such works by a public authority against the will of the company.

The CHAIRMAN said he thought Rotherham was a case in point.

Mr. POPE said it sometimes happened, when Committees were much impressed with the importance of a case, they told the parties that if they did not agree certain powers would be given, and this was the case at Rotherham. A public body obtained power to buy the works, and to make a profit, and then applied that profit to the general rates, they were, in point of fact, taxing the gas consumers for the benefit of the general ratepayers. In small communities, such as Stafford and Hanley, that inequality would not, perhaps, exist to a very large extent, but it did in other places. The proper principle was that included in the Gas-Works Clauses Act—to which all other gas companies were amenable—by which provision was made for giving the benefit to the consumer instead of to the general ratepayer. If the Company made more than the 5 per cent. which they asked for on their capital, it must go in the reduction of the price of gas, and the Company had no right to do that, and it was not pretended that there might not be some slight economy in the management of gas-works by the Corporation, because the Town Clerk was the law adviser of the Corporation, and that would save separate legal expenses in connection with the gas-works. It might also be that they would not do so much as they did, but, of course, what a paltry sum was the £300 or £400 which might be spent in expenses of that kind. Was there any justification for the Committee deciding that the gentlemen from Hanley should say to the Gas Company—who, with greater or less efficiency, had faithfully done their duty, and with fewer complaints than were generally met with in cases of the kind—"We will lay our hands on your property and goods, your Town Clerk and our Gas-works lectors will do the work that your collectors are doing; and we will compel you to sell the property which you do not wish to part with?" That was a monstrous doctrine. Of course, if there were a great public necessity—if the price of gas and the Company's demand for it were such that it was found that the Corporation of Hanley had tried to put into operation the powers given by the Gas-Works Clauses Act to ensure pure gas and sufficiency of pressure—if they found the legislation of the country to be insufficient to protect the Hanley people—then the Committee might say they would have to resort to an extreme remedy; but the Gas Corporation had not even attempted to employ those powers; they simply asked the Committee to reverse the decision of 1877 without any fresh cause. The Company did not ask the Committee for power to raise additional capital, because they could do that themselves, but they asked authority to supply the power for the development of the gas and water works in the Potteries. They also asked the Committee to limit them to a profit of 5 per cent. upon the capital so employed, and surely this was a modest request. Supposing the new capital had to be submitted to public competition, it was only necessary to look at the share of the 2½ per cent. and 5 per cent. or thereabout, that the public valuation of gas capital. In the Stockton case Parliament took care that

not only should a large sum be paid by the body that took possession—viz., 25 years purchase, which was equal to a 4 per cent. security—but it was also provided that they should pay for prospective profits of the Company, which amounted to £286,000. If the promoters were asking 7 per cent. on the new capital, the opposition would be reasonable, but they were only asking 5 per cent. If the Corporation bought the Company, they would have to pay 4 per cent. for the moment, and the Act of Parliament provided that they must form a sinking-fund to provide for its repayment, which would take 1 per cent. more, and the only difference, therefore, would be that in 50 years the gas-works would belong to the Corporation. Committees generally took care to sanction the raising of as much capital as would secure a company coming to Parliament to be overhauled in ten or twelve years; and if they thought the amount proposed was more than ought to be allowed, let them cut it down to what they considered right.

The committee-room was then cleared. On the counsel and parties being recalled.

The CHAIRMAN said the Committee were of opinion that the preamble of the Bill was proved; but they considered the proposed additional capital to be excessive, although they were willing to allow such an amount as would enable the Company to carry on their undertaking for ten years.

Mr. GENTY said, under these circumstances, the opponents of the Bill would not appear further before the Committee.

The clauses were then proceeded with. On clause 14, Mr. PENNY was recalled, and, in answer to the CHAIRMAN, said the Company must have a new tank and gasholder, which would cost £10,000; a new retort-house, £5000; £3000 for condensers, purifiers, governors, and exhausters would make up £30,000, which would be required to be spent immediately. He thought £50,000 would be a fair sum to grant, which would be £30,000 beyond the items he had mentioned.

The clause was amended accordingly. The remaining clauses were then read and agreed to, and the Chairman was directed to report the Bill, as amended, to the House.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

TUESDAY, JUNE 29.

(Before the MASTER of the ROLLS.)

IN RE OF THANET GAS COMPANY V. DAVIS.—DAVIS V. ISLE OF THANET GAS COMPANY.

These cases—which were before the Court several times last year, on motions by each side to restrain the proceedings of the other party—now came on for a final determination of the rights of the parties.

Mr. CHITTY, Q.C., and Mr. CHAPMAN BARBER appeared for the Company; Mr. BASHAWK, Q.C., and Mr. E. CURRIE for Mr. Davis.

Mr. CHITTY, in opening the case for the plaintiffs in the first action (the Gas Company), said the question at issue really depended on the construction of an Act of Parliament passed in the reign of Geo. IV., and the matter to be decided was whether the Company were or were not authorized to lay their pipes along their pipes along the public high road at a particular spot, the soil of which belonged to Mr. Davis, who objected apparently because he wanted to have private gas-works of his own.

The MASTER of the ROLLS said this was not the whole of the question. Why were there two actions?

Mr. CHITTY said Mr. Davis brought his action and moved for an injunction to restrain the Company from carrying their pipes through his land; but his friend Mr. BASHAWK had not the courage to face the question of construction on the motion, and saved the motion until the trial.

Mr. BASHAWK said it was not for want of courage. The reason he allowed the motion to stand over was that he was not one—viz., that the Company had gone through Mr. Davis's land; done all the mischief they could; and he had pulled up the pipes. Then the Gas Company brought their action to make him allow them to put them down again.

Mr. CHITTY then produced a map of the *locus in quo*, stating that Mr. Davis, as owner of the soil, claimed the right to have the pipes on the ground that the Company had no parliamentary powers there.

The MASTER of the ROLLS: It is a simple question whether you have or have not?

Mr. CHITTY said this was so. The Act he had referred to was entitled "An Act for lighting with gas the town and villages of Marseilles, Ramsgate, and Broadstairs, and the places adjacent, in the County of Kent."

The MASTER of the ROLLS said he remembered having to consider the words "and places adjacent" on the motion, and sending for some dictionaries. The question was by no means on the surface, and it was not always easy to construe the wording of an Act of Parliament. It was worse than a will generally, if there was any difference. He presumed the Company claimed a monopoly of supply, and so their Act must be construed strictly.

Mr. CHITTY said they were not claiming any monopoly. Parliament did not grant exclusive rights in these cases; but, as a rule, it did not grant powers to any single person, and the right of the plaintiff's party. He did not mention that this matter had been before a Parliamentary Committee, and they decided that the Company had *locus standi* to oppose the Bill promoted by Mr. Davis, which was in effect a decision that their limits were as wide as they contended for.

The MASTER of the ROLLS, who had been looking at the shorthand notes of his judgment on the motion, said he seemed to have taken a different view; but on these questions of construction there was no right and wrong. It was simply the view taken by the judge; one judge took one view, and another another. There was no value in it, except to the man who won, and as the French say—

Mr. CHITTY suggested that it was an Act which probably his Lordship would agree ought to be construed beneficially.

The MASTER of the ROLLS said it must be construed fairly. On the one hand it might be said it was an interference with private property; and on the other that it was for the public benefit. They must set off one against the other.

Mr. CHITTY said there was no interference here except with that which Parliament did not seem to think much of, viz., the right of going along the public high road. If the Company were within their limits, Parliament had no right to interfere with this trifling wrong. The motives of Mr. Davis, of course, were not material.

The MASTER of the ROLLS said the motive was quite immaterial. The only question was whether the Company had a right or not.

Mr. CHITTY said he supposed he had a right to read the title of the Act, and he had done so. The MASTER of the ROLLS said that was not the question.

Mr. BASHAWK said it did not matter, because exactly the same words were used in the preamble.

Mr. CHITTY said the House of Lords had now decided that the marginal notes could not be referred to.

Considerable discussion ensued on this point, in the course of which The MASTER of the ROLLS remarked that the rule had probably been

laid down in ignorance of the historical facts. Formerly judges had power to send for the original roll of Parliament in case of doubt, on which roll no marginal notes appeared, and consequently they were not part of the Act; but since the Act which made a Queen's Printer's copy evidence, that practice was gone; and Parliament had also changed its practice, and instead of a manuscript roll, had a printed roll from the same printer, on which marginal notes did appear, and they would therefore seem to be as much part of the Act as anything else. At the same time he agreed that the rule was practically a good one, because the marginal notes were often carelessly prepared, and were sometimes left in their original state after the clauses to which they referred had been altered. Strictly speaking, he should say he ought to be able to look at the notes, but he should not attach any value to them.

Mr. CHITTY then read the preamble of the Act, which commenced thus: "Whereas the towns or villages of Margate, Ramsgate, and Broadstairs, and places adjacent, in the Isle of Thanet, in the county of Kent, are populous, and the light on the streets and public roads, ways, passages, lanes, and places therein, and the suburbs and vicinity thereof, with gas, would be of advantage to the inhabitants thereof, and to the public at large."

The MASTER of the ROLLS, interrupting, said the whole question was "what is adjacent." It must be some populous place, at all events.

Mr. CHITTY submitted that the populous places were Margate, Ramsgate, and Broadstairs, not the places adjacent.

The MASTER of the ROLLS asked how far the place in question was from any one of these places.

Mr. CHITTY said the place was nearest to Margate. He would hand up an Ordinance map which was on the scale of 1 inch to a mile, by which it appeared to be about $\frac{1}{4}$ or 2 miles.

The MASTER of the ROLLS said it looked farther away than this.

Mr. BARBER said it was about $\frac{1}{2}$ mile from Westgate-on-Sea.

The MASTER of the ROLLS said the question was how far it was from Margate at the time the Act was passed.

Mr. BAGSHAW then produced a survey made in 1821 by a Mr. Wm. Edmonds, and published at the time, showing the point to which Margate extended. It was not, he said, strictly in evidence, and he did not know where it could be looked at.

Mr. CHITTY said he had no objection to the map being looked at, and he then handed up to his Lordship a map with the exact spot marked upon it.

The MASTER of the ROLLS said it was 3 miles from the houses, as near as could be.

Mr. CHITTY thought it was about 2½ miles.

The MASTER of the ROLLS said it was more than that.

Mr. CHITTY said he was measuring as the crow flies; perhaps his Lordship measured along the road.

The MASTER of the ROLLS: Yes; as the crow flies it would be about 2½ miles.

Mr. CHITTY said at the end of the section there were these words: "For the purpose of supplying the said towns of Margate, Ramsgate, Broadstairs, and the suburbs thereof, and parts and places adjacent."

The MASTER of the ROLLS: What does "adjacent" mean? Lying near. The question is how near.

Mr. CHITTY reminded his Lordship that in a previous case where he had to consider the meaning of the word "adjoining" he held that "adjoining" meant touching. "Adjoining" meant touching, but "adjacent" meant lying near. The prefix "ad" is to be used so as to express contiguity. So it was laid down in the dictionary.

The MASTER of the ROLLS said his opinion in the case mentioned was that adjacent and adjoining meant the same thing; but this was only his view of that particular case. It was quite plain it did not mean the whole Isle of Thanet, or it would have said so. The power was only to supply the houses within the said towns or villages, or the suburbs or vicinity thereof, or parts adjacent.

Mr. CHITTY submitted that this meant the parts adjacent to the suburbs. There was no reason why in this Act the words should not have a legal construction.

The MASTER of the ROLLS then referred to the "Imperial Dictionary," from which it appeared that "adjacent" meant lying near or close. This was 2½ or 3 miles off. He did not think it meant 3 miles out in the country. He did not mean to say that somebody else might not be of the same opinion, but he did not think it meant 3 miles off by the road, or 2½ miles as the crow flies.

Mr. BAGSHAW said if it did it must include the whole Isle of Thanet. Every dictionary he had seen gave the same meaning—lying near or close.

Mr. CHITTY said this place lay near the vicinity.

The MASTER of the ROLLS said it was 2½ miles as the crow flies, and 3 miles out of town by the road at the time the Act was passed.

Mr. CHITTY said the Act was passed for the purpose of supplying the inhabitants with gas.

The MASTER of the ROLLS said the Company at that time never dreamt of supplying this place. They meant the towns and villages, not people in the country or lone farmhouses. At that time this place was out in the middle of the country.

Mr. CHITTY said there was a section of the Act which said the Company must erect six stations. Why should they erect six stations for Ramsgate, Margate, and Broadstairs?

The MASTER of the ROLLS said he did not know; but, as he understood, this place was then out in the country.

Mr. CHITTY said that Birchington was a village on the London road.

The MASTER of the ROLLS said Birchington was not mentioned in the Act—the villages named were Margate, Ramsgate, Broadstairs, and therefore Birchington could not be considered. He should say that an independent village was not to be included. He was of opinion, though the Court of Appeal might take an opposite view, that "places adjacent" did not mean 3 miles out in the country, with probably not even a lone farmhouse there. He could only give his opinion.

Mr. BAGSHAW said he supposed this judgment would carry the costs of both actions, including the motions.

The MASTER of the ROLLS said yes. In his opinion the place in dispute was not adjacent.

Mr. CHITTY said he took it that his Lordship only decided with reference to the locus in quo—nothing else.

The MASTER of the ROLLS said no—nothing else. The place was out in the open country at the time the Act was passed, and was not "adjacent" to Margate, which was the nearest place.

Mr. BAGSHAW said he presumed the injunction would be discharged, and Mr. Davis would be at liberty to take up the pipes.

The MASTER of the ROLLS said yes. He did not decide anything as to any other place. There might be other consumers as regarded other places.

Mr. BAGSHAW said, subject to an appeal, they would take the pipes away.

The MASTER of the ROLLS said it was a mere question of opinion on the meaning of the term "adjacent."

Mr. BAGSHAW remarked that the operation of taking away charged gas-pipes was rather difficult.

The MASTER of the ROLLS, addressing Mr. Chitty, said: If you do not appeal you must take them away.

Mr. CHITTY afterwards produced "Worcester's Dictionary" to show that what is "adjacent" may be "separated by the intervention of some other object."

The MASTER of the ROLLS said "Worcester's Dictionary" was not a legal authority. The use of language in America was more liberal, and he did not, for this reason, like quoting American dictionaries, especially on legal questions.

Mr. CHITTY said that in America they often preserved English words which had fallen out of use, and the late Mr. John Forster, who was a high authority on such questions, recommended this dictionary to him as a very good one.

The MASTER of the ROLLS said in America they were very lax in interpretation, the reason being that they had not one capital as we have in England.

Judgment accordingly.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

The Chief Gas Examiner of the Metropolis (Dr. Williamson, F.R.S.) has just presented his report on the examinations of the gas supplied by The Gaslight and Coke, Commercial, and South Metropolitan Gas Companies, during the quarter ending the 30th of June:—

I. As regards Illuminating Power.—The following is the average for the quarter at each of the testing-stations, in standard sperm candles:—

The Gaslight and Coke Company—	
Beckton (common gas)	17.4
Friendly Place	16.8
Millbank Street (amalg gas)	21.2
Ladbroke Grove (common gas)	19.2
Devon's Road	17.2
Carlisle Square	16.7
Camden Street	17.0
Graham Road	17.0
Commercial Gas Company—	
Parnell Road (common gas)	17.0
Wellclose Square	16.5
South Metropolitan Gas Company—	
Hill Street, S.E. (common gas)	16.8

From these results it will be seen that with regard to illuminating power the average for the quarter has been at all the stations of the three Companies above the requirements of the Acts of Parliament, more especially at the Beckton, Millbank Street, Ladbroke Grove, Devon's Road, Camden Street, and Graham Road stations of The Gaslight and Coke Company, and the Parnell Road station of the Commercial Company.

II. As regards Purity.—Sulphuretted hydrogen has not been present in the gas at any of the testing stations. The average proportions of sulphur in other forms than this were as follows:—

Grains of Sulphur per 100 Cubic Feet of Gas.

The Gaslight and Coke Company—	
Beckton	10.6
Friendly Place	8.9
Millbank Street	10.3
Ladbroke Grove	10.3
Devon's Road	10.6
Carlisle Square	14.5
Camden Street	11.3
Graham Road	11.3
Commercial Gas Company—	
Parnell Road	9.8
Wellclose Square	9.6
South Metropolitan Gas Company—	
Hill Street, S.E.	11.8

The maximum amount of sulphur found in the gas manufactured by the three Companies has, at all their respective stations, been below the limit fixed by the Acts of Parliament. The gas in each case has been very considerably below those limits, especially at the Friendly Place, Millbank Street, and Ladbroke Grove stations of The Gaslight and Coke Company, and the two stations of the Commercial Company.

At the Beckton and Camden Street stations of The Gaslight and Coke Company amounts have not been present in the gas. At the Devon's Road and Graham Road stations of the same Company it has appeared rarely. At the other stations of the three Companies it has been present in small quantities. The average in each case has been far below the maximum allowed by the Acts.

THE NOTTINGHAM CORPORATION GAS-WORKS.

In the course of the past month a formal visit was made by the Corporation of Nottingham to the whole of the gas-works supplying the borough, and the other property connected therewith. The Mayor (Sir James Oldknow) was one of the party, which was conducted by the Engineer (Mr. M. Ogilvie Tarbotton); while Alderman Thackeray, the Chairman of the Gas Committee, and Mr. John Wilson, the General Manager of the Gas Department, were also present.

It may be remembered that the works were bought in 1874 from the old Gas Company, and have since been managed by a Committee of the Corporation. The price of gas has in the six years been three times reduced; the charge now being only 2s. 10d. per 1000 feet to small consumers.

Previous to the visit a very interesting report, prepared by Mr. Tarbotton, was placed in the hands of each member of the Town Council, and to this we are indebted for the particulars we now give of the various departments of the gas undertaking.

The first place visited was the Giltbrook Chemical Works, established for the purpose of dealing with and manipulating the ammoniacal liquor and tar. The liquor produced at the three manufacturing stations (Easterford, Radford, and Basford), and which now amounts to nearly 3 million gallons in the course of twelve months, is conveyed by boats to the works at Giltbrook, and converted into commercial sulphate of ammonia. The tar also, from the several manufacturing stations, is conveyed by boat or rail to Giltbrook, and distilled into secondary and other products, some of which are transported into other localities, principally to the Continent, to be used for local purposes and for the formation of artificial fuel, for which the bulk is shipped to the Continent. The sulphate of ammonia manufacture was formerly conducted at small works at Poplar, in Nottingham; but, in consequence of the nuisance which was created, the works at Giltbrook were established by the late Corporation. The works were also carried on by the Company on a small scale at Aysworth. Since the transfer of the gas undertaking to the Corporation, however, the present consolidated works at Giltbrook have been built. In 1878 the Corporation applied to Parliament for powers to establish the works, and during the years 1878-79 they were

erected, and consist of a complete manufactory for the chemical treatment of ammoniacal liquor and tar. The work done at Aysworth have substantially been completed. The works embrace canal wharves, ways, sidings, offices, tanks and reservoirs, stills, condensers, purifiers, scrubbers, exhausters, engines, boilers and pumps, separating and storage tanks, saturators, mixers, presses, and other like machinery; also special stills for anthracene and a commodious pitch bay. The works are now in full operation, and are leased by the Corporation for a term of years expiring in January, 1883. Most of the tar and liquor is purchased by the lessee, under his contract with the Corporation, and removed to Giltbrook, where the various processes are conducted throughout the year, fairly free from smell or local nuisance.

The Basford Gas-Works, next visited, are comparatively new, and occupy a portion of a piece of land, dedicated by Act of Parliament to gas manufacture, consisting of upwards of 23 acres. The existing works will, in course of time, be triplicated in extent. The present carbonizing power consists of 512 retorts, with all the necessary condensers, purifiers, exhausters, gasholders, steam and other engines, machinery, and apparatus. At these works about 2½ million cubic feet of gas can be produced daily. The property embraces a large house (occupied by the Vicar of Basford), shortly to be converted into offices, also superintendents and other houses, and the ordinary adjuncts of a complete gas manufacturing station. Since the transfer of the gas-works to the Corporation, a large new holder has been built at these works, on the east side of the Midland Railway, also a large liquor-tank, and sheds, lodges, office, and boundary walls. Pumps and mains have been put down for conveying the ammoniacal liquor to Wollaton Wharf (about 2½ miles distant) in order to save the expense and nuisance of carting the same through the streets. The establishment is shortly to be enlarged to meet the rapid increase in the consumption of gas throughout the district.

The party then proceeded to the Radford Gas-Works, which originally covered a little over 4½ acres, but in the parliamentary session of 1879 the area was extended, by about 2 acres, for the purposes of general enlargement. Practically the Radford works are entirely new, for since the transfer of the gas undertaking to the Corporation they have been (with the exception of the shell of the old retort-house, and the entrance and offices) reconstructed. The works now in progress consist of a carbonizing-house, purifying-house, meter and governor house, coal-sheds, liquor and tar tanks, condensers, purifiers, large gasholder, washers, and gas-gas apparatus. The gas-works will approach 2 millions of cubic feet of gas per diem. The number of retorts is 578. The new holder will be 100 feet in diameter, and will be capable of containing nearly 1½ million cubic feet of gas; the total storage at these works being about 1½ million cubic feet.

The area covered by the Eastcroft works is a little over 7 acres, and the land is fully utilized. The buildings consist of four retort-houses, coal-sheds, two purifying-houses, two meter-houses, engine-house, superintendents houses, general offices, stables, &c. The works comprise 515 retorts, six holders, and all the usual and modern appliances and apparatus for gas manufacture; and although the oldest works of the late Company, they are in excellent working condition. The carbonizing power is equal to about 2½ million cubic feet of gas per diem. Since the transfer of the works to the Corporation, a new large tank and telescopic gasholder have been constructed at the works; also two new coal-sheds, four new purifiers, stables, offices, tar-gauging tanks, and boilers have been provided and brought into use.

The estimated length of mains laid throughout the district is about 200 miles, and a new large main is now being laid from the Basford works to Wilford Road, Nottingham, passing through the works in course of extension at Radford. This main is 2 feet 6 inches in diameter for short distance, and 3 feet 6 inches beyond, and is required to provide for the increasing consumption of gas in the Leen Valley, and to regulate the discharge of gas from the several stations.

In 1878 the Corporation purchased a piece of land at Eastwood, consisting of about 11 acres, and afterwards obtained parliamentary powers to extend the land to the Leen Valley, and to the Nottingham Canal, and by the Great Northern Railway, the Nottingham Canal, and the highway leading from Eastwood to Heanor; and thus is an admirable site for new gas-works, which at probably no very distant time will be required for the neighbourhood.

The present gas-producing power of all the works, when the Radford extensions are completed, may be taken at from 6 to 6½ million cubic feet per day. The largest daily consumption during last winter was nearly 5½ million cubic feet; while the total consumption during last year was nearly 1000 million cubic feet. The consumption of gas is increasing at the rate of from 7 to 8 per cent. per annum; so that if this increase continues, the works will require to be duplicated every ten years. The present number of consumers meters is nearly 82,000. The parliamentary district of the Corporation Gas-Works contains 85,361 acres, or nearly 184 square miles, and embraces 41 towns or parishes, with an aggregate population of about 280,000. The average illuminating power of the gas supplied is equal to about 175 sperms candles in the district generally; and is, of course, rather higher at the works.

VISIT TO THE CHELSEA WATER COMPANY'S WORKS.

On Saturday, the 26th ult., the half-yearly inspection of the works of the above-named Company was made by the Governor (Mr. John Deedes), the Deputy-Governor (Sir W. H. Wyatt), and the Directors (Messrs. W. H. Yatman, W. H. Child, W. P. Bodkin, J. S. Clayton, R. W. Moore, J. S. Wigg, and Colonel Sir John Wilford), aided by the Secretary (Mr. Albert Gill), the Engineers (Messrs. Simpson and Leach), and Messrs. H. Gill, W. H. Turner, and G. Lott. About 70 invitations were accepted.

The party assembled shortly before midday at the Waterloo Station, and proceeded thence by train to the works at West Molesey, where the superintendent resident (Mr. Deedes) met the party, and the works here occupying altogether about 60 acres, and the metropolis, the proprietors' Luncheon was afterwards served in a tent on the grounds. Mr. DEEDES occupied the chair.

The usual loyal toasts having been drunk, Sir W. H. WYATT proposed, "Well-doing and success to the Water Companies which supply the Metropolis." They were, he said, favoured more or less with representatives from all the different Companies, and it was gratifying to see them on this occasion. As they had been engaged in a common fight for their existence, they had had to meet much more freely than during the past few months, and had been enabled to see how thoroughly the property of the Companies and the interests of the proprietors were looked after. Secondly, but not much secondarily, they considered the interests of the ratepayers. He coupled the toast with the name of Mr. John Miles, the Governor of the New River Company.

The toast having been drunk,

Mr. MILES said they had had great pleasure in seeing the Company's works, which were carried on with so much benefit to the ratepayers, who had not been called on to contribute to their cost. All present were aware of what was going on in connection with the Metropolitan Water Companies, and he thought it would be wiser to say nothing, but await the issue. The Thames supply had been improved by all the works, and he was sure that the chemical gentlemen present would back him up when he stated that they had nothing to fear from that supply.

The CHAIRMAN, in proposing the next toast, said they had been honoured with the presence of four gentlemen who, he believed, were Medical Officers of Boards of Health—Dr. Tidy, Dr. Frankland, Dr. Duffield, and Dr. Collier, and he thought the Company showed some courage in submitting their works, at the present critical moment, to the inspection of gentlemen of such eminence. They felt, however, that they could do so, and that the verdict of those gentlemen would be in favour of the Company. At the present moment the eyes of many were turned on the proceedings of the London Water Companies, but he hoped that they had succeeded in keeping their house in order. He asked them to drink the health of none of the gentlemen he had mentioned.

The toast having been duly honoured.

Dr. FRANKLAND, in returning thanks, said he did so not as a Medical Officer of Health, but as a Chemist. He occupied a very critical position, and one which it was difficult to fill with any sort of credit, for if he complained of the water supplied to the Metropolis, the public were only too ready to attribute a malicious intent, and did not thank him while the Companies took rather a hostile view of his reports. On several occasions he had had to comment on the quality of the London Water Supply, more especially that part of it taken from the Thames, and he thought that on one or two occasions he had been so severely reproached, that he had almost been driven to a madhouse. The Chelsea Company had worked under very great difficulty for a long series of years, and until they acquired the land where they were then assembled, upon which to develop their purifying processes, it was quite impossible for them at all times of the year to deliver water satisfactory to the consumers; but he must say that there had been no case of the Companies delivering water in London, either from the Thames or elsewhere, who had done more to improve the supply than the Chelsea Company. At the present moment the Company stood pre-eminent for the quality of the supply which they delivered from the Thames. He would not say a word about the quality of the Thames water had not said a word about it, and he did not think it was his duty to deputed, he might say, by Parliament to supply water to London had very little to do. At enormous expense they had removed their intakes from an objectionable part of the Thames to at all events a far less objectionable part, and he must say that of late years—though, of course, as a chemist he could say nothing about it—had been so good, that he thought it would be his duty to do all that was reasonably within their power to improve the supply. Although as a Company they must look forward to paying their Shareholders dividends, he was bound to say also that they had looked at the public good, and had spent a large amount of capital entirely with this object in view, and the view of improving the supply, without at all times he could say that it was possible to improve it further, still he did think they had set the example to all Companies drawing from the Thames, in the great work they had undertaken for the improvement of their supply. Few people in London had an adequate idea of the difficulties of supplying a great district. It was very easy to criticize the defects of any supply in the laboratory, but was another thing to do so in practice; and no one felt more than he the difficulties the Companies had had to encounter. He trusted that the representatives of the Water Companies present would not be too angry with him if he had from the consumers point of view tried to put a little pressure on them.

Dr. FRANKLAND then called on the gentlemen who were present for their kind invitation. They had not, he said, been that day fed on water, though he should not have been altogether sorry if they had been, in order that he might see the result of such an experiment when he met some of them in the course of a week's time. He must say for the Chelsea Company, that he had been heartily told by Mr. Frankland (in this matter) that it had always appeared to him that they had had in view, not simply the question of the rights of their Shareholders, but also a very distinct notion of what might be called parliamentary responsibility. He thought all present would agree in saying that the Chelsea Company would be a great deal better than the others, and he looked at the rights which an Act of Parliament gave them. On this great subject there would, of course, be a variety of opinions, and the present was not the time for their discussion; but he thought he might venture to say this—that, whatever opinions they held, he was sure the Company tried to do the very best they could.

The CHAIRMAN thought he might say they had all been admiring the Company's works that morning, and, as Mr. AIRD, the Contractor, was present, he asked them to join him in drinking the health of that gentleman.

The toast was drunk, and

Mr. AIRD having expressed his acknowledgments,

Sir W. H. WYATT said they had drunk to the success of the Water Companies of London, and had coupled with that toast the health of the Chairman of one of the Companies; but all of them who had anything to do with those companies knew that the water was not only good, but that it was the result of the efforts of the officers devoted to their service. From his own personal experience during the past few months, he could say that the Metropolitan Water Companies were supplied with officers, both as Managers, Secretaries, and Engineers, who really were entitled to the highest possible praise. They performed their duties with a single eye to the good of the public, and the Water Companies ought to feel extremely grateful, and he believed that every Company had reason to be satisfied with the exertions of its officers. He therefore asked them to drink the health of the Officers of the Water Companies, and he coupled the toast with the name of Mr. Inglis, the Secretary of the New River Company.

The toast was drunk with enthusiasm.

Mr. INGLIS, in returning thanks, said the officers of the Companies represented the levers of wood and the drawers of water. They drew the water, collected the rates, and then they had the magnificent materials to work with, and he was very glad to hear that the magnificent tools. There had been times in which the tools of the Water Companies were very poor indeed. They, however—the workmen—did not complain; but happily the tools were now very much improved, and they saw before them that day, and upon that day, and the magnificent materials to work with, and the magnificent tools. There had been times in which the tools of the Water Companies were very poor indeed. They, however—the workmen—did not complain; but happily the tools were now very much improved, and they saw before them that day, and upon that day, and the magnificent materials to work with, and the magnificent tools. There had been times in which the tools of the Water Companies were very poor indeed. They, however—the workmen—did not complain; but happily the tools were now very much improved, and they saw before them that day, and upon that day, and the magnificent materials to work with, and the magnificent tools.

The CHAIRMAN then referred to the presence of Dr. Farquharson, M.P., and Mr. T. H. Haskley, C.E.—gentlemen who were both well known to the Board. He proposed the health of the visitors, coupling with it the name of Dr. Farquharson.

The toast having been duly honoured,

Dr. FARQUHARSON expressed the satisfaction the visitors had had in going over the Company's works, and observed that they must all feel

grateful to the Companies who at so much cost and credit to themselves brought into the houses of London the supply of water which they so much appreciated.

Mr. HAWKSLEY also responded.

Sir W. H. WYATT, in proposing the next toast, "The health of the scientific gentlemen present," said when they went to Parliament they had to prove an amazing number of things, and their own knowledge went for nothing—they must have the assistance of scientific gentlemen, a number of whom they had succeeded in bringing round them. He coupled with the toast the name of Dr. Pole, who, he said, gave evidence before the Duke of Richmond's celebrated Commission, which did more perhaps for them than any other evidence which had been given.

The toast having been drunk,

Dr. POLE, in acknowledging it, said that he had had a great deal to do with the question of the London Water Supply, and in particular with the Duke of Richmond's Commission, of which he was Secretary, and which was now before the House. In the Duke's Commission, it was clearly established, that London was admirably supplied with water of the Thames, and that the water of the Thames formed the best supply for London. The Companies had endeavoured to do all they could to improve the supply, and in the direction he thought there would not be much fear of any scheme interfering with the supply. But if they had had, however, rose up periodically to give the Companies, he supposed, a little flip to keep them up to the mark, and they had always been required of them. He thought they had nothing to fear from Dr. POLE.

Mr. G. SMITH, Chairman of the Kent Company, said he had been requested to propose the toast of the day, "The health and prosperity of the Chelsea Company." They were all brethren—were arraigned before one tribunal at the present moment, fighting one common battle, and he hoped they would all come out with one success. He was sure they had derived information from each other, and he trusted to the company's works. They might all gather information from one another from these *réunions*, and they might often assist and strengthen each other. They had been very much gratified with what they had seen, and were much inclined to increase their fraternal hospitality.

The toast was drunk with enthusiasm, and three cheers and "one cheer more" were given for the Governor.

Mr. DESBRES expressed the pleasure his Company had had in receiving their visitors on this occasion. They had thought the time was not inopportune for asking them to inspect the Company's works, and see what they had been doing. Whatever the future might be, it would be a matter of sincere pleasure to remember that the Metropolitan Water Companies had for the most part acted in harmony with one another, and whatever might happen he hoped this friendship would not abate. He thanked them on behalf of his colleagues and himself for the manner in which they had drunk the toast, and on his own part for the "one cheer more" which had been bestowed on himself.

Sir W. H. WYATT said there was yet one more toast. The Chelsea Company was admirably served by its officers. Whether they took their excellent friend the Secretary, Mr. Gill, who worked with a zeal which was past commendation, whether they took the heads of the engineering department, Messrs. Simpson and Lea, or whether they took the head of the Solicitor's department, Mr. Few, they were admirably served in every department. Unless seconded by the efforts of those gentlemen, their own work would be of little avail. He asked them to drink the health of the Officers of the Chelsea Company, coupling with it the name of Mr. Gill.

Mr. GILL thanked Sir W. Wyatt for the kind way in which he had proposed the toast, and those present for the way in which they had received it. His friend Mr. Inglis had reminded them that "a bad workman complains of his tools." They had, however, lately had very good tools, supplied by Sir W. Wyatt, and they were glad to say that they had never any excuse for not performing their work thoroughly well. He was glad that their customers were perfectly satisfied, for he received no complaints from them of the quality of the water, and he really did think they had done very well. He was glad to hear that Sir W. Wyatt was the friend of his superiors, and it was very kind of Sir William Wyatt to say that he discharged his duties satisfactorily. He was ably assisted by an excellent staff, and he added *ex amore*, and to them he thought the prosperity of the Corporation.

The visitors then separated for a few minutes, but shortly afterwards re-assembled and proceeded by boat down the river to Seething Wells, where the filter-beds, pumping machinery, and the works generally were inspected.

The following is a general description of the works of the Company, circulated for the information of the visitors. The water is not taken from the Thames at about half a mile below Sunbury Lock. It has at first to pass through an iron grating at the intake—guarded by a moveable wooden screen, so arranged as to prevent the accumulation of river weeds from being drawn through the grating—and then through two fine wire screens, which are placed in the tank, through which the water is pumped into the regulating-tank (a lift of about 19 feet) where it is stored by four engines each of 40-horse power. From the regulating-tank the water runs into any one of the four subsidence reservoirs. Each of these is capable of holding 35 million gallons, the capacity of the four being together 140 millions. When necessary, the water can be delivered into the 36-inch filter-beds, which are situated in the filter-house at Seething Wells, a distance of 5 miles. From the reservoir the water is conveyed through a 36-inch main to the filter-beds at Seething Wells. The filter-beds are seven in number, and have an area of about 7 acres. Four or five of these filters are usually in work (according to the condition of the water) and the others are kept up the supply to the service reservoirs on Putney Heath. The filter that is not in use is kept in reserve, and is drawn from the surface (usually about 2 inches of it) is removed, washed, dried and replaced. When this is done, they are in their turn "flooded," and the others drained off and treated in the same manner. The water is first passed through a coarse ballast, coarse and fine gravel, and a layer of sand, and then through a layer of fine sand, the total depth of materials being 8 feet. From the filter-beds the water runs into the filtered water-tanks, and thence into the engine wells, from which it is pumped up to the service reservoirs on Putney Heath, a distance of over 4 miles, through three mains, two of 80 inches and one of 15 inches diameter. The three service-reservoirs are supplied by three engines, each working in pairs; four of these (two pairs) are of 150-horse power each and are capable of supplying 100 million gallons per day, and the other two, of 100 gallons per day to four service reservoirs on Putney Heath. Four only of the engines are worked at a time, and two are held in reserve. The service reservoirs on Putney Heath are capable of holding 11 million gallons, being 15 feet above the level of the engine wells at Kingston. From these reservoirs, the water is conveyed through four mains—viz., two of 24 inches and two of 12 inches diameter, to Putney, where they pass over the river to Fulham. From Fulham they are branched off at various points into the service-pipes, through which the domestic supply of the whole district is afforded. From the Putney works, the water is conveyed by gravitation into the district to an altitude of about 120 feet above Trinity Street.

THE USE OF "IRON SPONGE" FOR THE PURIFICATION OF GAS.

At the First Annual Meeting of the Central New York Gas Engineers Association, held at Syracuse, N.Y., on Thursday, May 20, a paper, on "Iron Sponge," was read by Mr. C. A. WHITE, of Rochester, N.Y., and we now reproduce it from the "Official Report" in the *American Gaslight Journal* of the 16th ult. It was as follows:—

The use of a new material for the purification of gas, known as "iron sponge," has for some little time been attracting the attention of the profession, and quite a number of companies are using it with marked beneficial results.

Iron sponge is obtained by treating oxide of iron in contact with carbon at a suitable heat, with practically complete isolation from the atmosphere. It retains the general shape of the ore from which it is derived, though expanded in bulk, and showing a marked loss of weight. The sponge consists of the now volatile matter of the raw ore; that is, the portion not capable of volatilization, either by the degree of heat employed, or by contact with the carbonaceous mass. The volatile matter separating from the ore leaves minute cells throughout its entire mass, rendering it extremely sensitive to chemical action.

Before entering into a consideration of the action of gas upon the sponge, it will be better that I should allude briefly to the manner of preparing the sponge for the boxes, the process being simply to wet the sponge, and turn it over until the mass is perfectly wet through, or rather moistened, so as to adhere slightly when pressed in the hand.

Regarding the chemical action of the gas upon the sponge, not having any apparatus for experiment, I submit the opinions of Mr. Robert Young, Engineer and Superintendent of the Allegheny City Gas Company, who has been for some time engaged in the study of the subject. He says that this is placed in the purifying-box, and the sulphuretted hydrogen brought in contact with it. The three atoms of oxygen combine with three atoms of hydrogen, and form water, and three atoms of hydrogen are liberated; and the sulphur, which is in the form of iron sulphide (FeS_2), on exposure to the air the oxygen displaces the sulphur, and the iron re-oxidizes. Thus it continues until we have more sulphur than iron (for it increases in bulk every time it is used, the increase being stored in the gas), and the iron is oxidized, and the sulphur is increased the sulphur so much that it will not pay to handle it.

Now for the carbonic acid. The material holds a large amount of water that takes up any ammonia which may pass the scrubber. This will neutralize the carbonic acid and form carbonate of ammonia. If I find, on testing the gas after it leaves the purifying-boxes, any carbonic acid, I let a little more ammonia pass the scrubber, and that neutralizes it; and there is no trouble unless I get more carbonate of ammonia than the water is able to hold, when it would pass off with the gas, though I have never found this to be the case yet.

When we charge a box and expose the material to the air, the rapid oxidation of the iron causes the mass to become very hot, but not red hot, and the carbonate of ammonia and water are evolved, which is readily detected on going into the room; but there are no obnoxious odours, as there are from lime.

Professor George Hay, Analytical Chemist of Pittsburgh, Pa., says that iron sponge has been manufactured for years in England and Scotland for the purpose of filtering water—depriving water contaminated by organic impurities of its sulphur, which remains with the iron as sulphide of iron. The iron sponge is prepared by the action of sulphuric acid upon phosphorus, leaving the phosphorus removed, together with mechanically suspended impurities, leaving the water hardy, if at all, putrescible. Its minute state of division and its porosity increase its affinity for sulphur in any form. In iron sponge purifying material the iron exists as hydrated sesquioxide, in which condition its affinity for sulphur in the form of sulphuretted hydrogen, ferrocyanogen, sulphide of ammonium, or other sulphides, is very strong.

Having thus considered the preparation of the sponge and the action of the gas thereon, let us look upon the working results that have been obtained by its use, under which would naturally arise the questions—Does it fulfil the claim of the manufacturers in an increased purification of gas per bushel? Is there any reduction in pressure? Is there the same amount of obnoxious odours present as in the use of lime? Can we claim a saving not alone in material, but in labour?

It certainly does give an increased purification per bushel, as actually demonstrated by its use at the works of which I was Engineer. It is needless for me to enter into the details of how we came to adopt the iron sponge at our works; suffice it that in December, 1879, we commenced its use. I will here add that I was at the outset somewhat afraid that it would not prove to be what it was represented, as the boxes required to be filled with 1500 cubic feet of iron sponge per bushel. Still I was partly prepared for this, as I had been informed that it required some time to develop its merits.

Mr. Young's statement of the chemical action shows exactly why this is so. The second charge of the boxes—that is, the second time the material was used—showed a purification of 2000 cubic feet per bushel; third time, 2500 do.; fourth time, 3025 do.; fifth time, 4120 do.; sixth time, 5460 do.; and gradually increasing until a maximum of 12,710 cubic feet per bushel has been obtained.

I propose to compare briefly the results of the months of February, March, and April, of the years 1879 and 1880, the former using lime, the latter the iron sponge:—

Feb., 1879 (lime)	6,250 cubic feet per bushel.
March, 1879	7,268 " "
April, 1879	5,900 " "

On an average of 0.4700 each 100 bushels

For the same months, using the iron sponge, and that not nearly up to what it should do, has done—

Feb., 1880 (iron sponge)	. 6,200	cubic feet per bushel.
March, 1880, "	. 9,882	" "
April, 1880, "	. 11,300	" "

Or an average of . . . 9,127 cubic feet per bushel.
Showing an increase over time of nearly 41 per cent.

The number of days the boxes lasted was—

	Feb.	March.	April.
1879. Lime	4 ..	6 ..	6
1880. Sponge	7 ..	15	15
Total gas manufactured during three months of 1879 . 12,404,000 cubic feet.			

Or an increase of 8 per cent. over 1879.

The decrease in pressure, as shown at inlet to centre seal, was 2-10ths of an inch, and this has remained since using the sponge. There is certainly an absence of most of the obnoxious vapours that are present with the use of lime, and the men who do the work state that it does not have the same deleterious effect upon the eyes, and they much prefer its use.

After some discussion, it was resolved to recommend to the Gas Corporation that the price of gas remain the same as last year—namely, 5s. per 1000 feet.

The annual general meeting of the Anchorerider Gaslight Company was held on Monday, the 28th ult., when it was resolved to declare a dividend of 8 per cent. on the past year's transactions.

The Kennoway Gaslight Company have reduced the price of their gas 10d. per 1000 cubic feet—from 10s. to 9s. 3d.

The annual meeting of the Kelso Gas Company was held on the 30th ult.—Mr. J. P. S. Duff, the Chairman, presiding. After the statement of accounts for the past year had been submitted and considered, it was resolved to declare the usual dividend of 10 per cent.

A dividend of 7½ per cent. was agreed to at the annual meeting of the Jedburgh Gas Company, which was held last Wednesday, and a sum of £100 was voted to the reserve-fund.

As I anticipated, the question of "The Cheapest Gas in Scotland" is bound to be one of some interest for a time. Already the Directors of the Galashiels Gas Company have followed with the announcement of a reduction in price from 3s. 6d. to 3s. 4d. per 1000 feet, which is certainly the lowest price for gas yet announced in any town in Scotland, whether within or far removed from the coal-fields whence rich canal coal is obtained.

At the annual meeting of the Hawick Gas Company, held last Friday, the report of the Directors was adopted. Its chief feature of interest was the notice in the notice of the meeting of the reduction of 3d. per 1000 cubic feet as indicated in last week's "Notes." A motion to amend an agreement of the Company as to the qualification of Directors, and the percentage to be deducted for depreciation of property, was after some discussion as to its coming before the meeting in proper legal form, withdrawn. Several interesting papers were read in connection with the affairs of the Company, more especially by large consumers.

In connection with the magnificent vessel which is being built by Messrs. Elder and Co. for the Emperor of Russia, as a pleasure yacht—a floating palace—the electric light is being used on an extensive scale, so that it may be ready for launching in time. There are now six lamps in use on the vessel itself, and fully that number are giving forth their brilliant light in the works where the immense engines for the yacht are being erected. Even after the launching of the vessel the electric light is to be employed for the benefit of the night shift; and, eventually, the floating palace is to be fitted up with about 30 electric lamps, supplied with the necessary currents from a Siemens magneto-electric machine of great power.

The Glasgow pig iron warrant market has been very firm during the past week. There was only a limited amount of business done, but a large quantity of business was done on the 28th and 29th ult. 9d. cash was paid on Thursday, and on Friday afternoon up to 49s. 4½d. cash was paid, although the price was somewhat lower at the close of the market.

From all the mining districts there are reports of a marked degree of dullness in the coal trade.

A new list of Members of the Institution of Civil Engineers has just been issued, from which it appears that there are now on the books 1217 Members, 1299 Associate Members, 679 Associates, 18 Honorary Members, and 657 Students—together 3770 of all classes. At the same period last year the numbers of the several classes were 1148, 1200, 422, 17, and 591, making a total of 3078; showing an increase at the rate of nearly 5½ per cent. During the past session, the elections have comprised 10 Honorary Members, 43 Members, 139 Associate Members, and 15 Associates; and 150 Students have been admitted. The Council have just published their list of awards "for some of the original communications presented during the past session, or according to the selection of the Society." Among others we notice that a Telford medal, and a Telford premium, have been awarded to Mr. H. E. Jones, for his paper on "The Purification of Gas;" a Telford premium to Mr. C. J. Wood, for his paper on "Tunnel Outlets and Gas Reservoirs;" and a Manby premium to Mr. G. Chatterton, M.A., for his paper on "The Main Drainage of Torquay."

PITTEVENN GAS COMPANY.—The annual general meeting of this Company was held on Friday, the 25th ult., when an abstract of the accounts for the year ending May 31 last was presented. It showed a balance of profit on the working of about £500, and out of this amount it was resolved to declare a dividend of 8 per cent. and carry the balance to the works account and to the reduction of cost of extensions made during the past year. The price charged for gas supplied by the Company is 5s. 10d. per 1000 feet—the lowest it has ever reached; and although it was pointed out at the meeting that a reduction of 10d. per 1000 feet could be made, without fear of a diminution of dividend for the current year, it was still leave a balance of £130 to be carried to the works account, it was determined to keep the price as at present. During the past year the Company sent into the two districts supplied by them—Pittenvenn and St. Monance—2,730,710 cubic feet of gas, the coal for the production of which had cost at the rate of 1s. 10½d. per 1000 feet. The past year's working was regarded as the most successful the Company have ever had, and in recognition of the efforts of the *employés* to bring about such a result, it was unanimously agreed to give them various small sums of money according to their position in the works. The capital of the Company is only £2000.

GAS CONSUMERS AND THEIR RESIDUALS.—The *Chemical News* of Friday, the 25th ult., contained an article, by F. E. Smith, of the Chemical Society and of the Institute of Chemistry, headed "Distillation of Gas Tar." Tar Distillers v. Gas Companies," which, after pointing out the vast strides made during recent years in the treatment of residuals, refers specially to the various chemical products having been lately started by the hattered Gas Company at Beckton. The writer holds that the new movement now was taking place, and influencing gas manufacture, is a step in the right direction, and is one which is calculated to introduce progress and reform in a process hitherto admittedly crude. He considers that the distillation of gas tar into compounds such as ammonia, benzol, naphthalene, creosote, and anthracene up to the point of their use within a gas manager's province, and in absorbing the larger share of the industry, which he believes ultimately will be done, it is lifted from an antiquated and empirical position, and placed on a footing where it will receive the many advantages derivable from the infusion of new blood, and the supervision and direction springing from the more advanced knowledge and requirements of the present times. The article concludes in these words: "We think it is not too much to hazard this assertion, inasmuch as already we see fruit of a venture that at the period of its contemplation met with considerable ridicule and evil prognostication. It was urged, on the one hand, that 'no gas company would either succeed in distilling tar.' It was said, on the other, that they lacked experience, and knowledge was impossible to obtain. More, that even if actually launched and in operation they would fall in showing financial success.' Yet, in the brief space of a few short months has sprung up in our midst one of the finest and most perfect plants for tar distilling in the kingdom, and on

the grounds and within the walls of an English Gas Company, second to none in dimension, efficiency, utility, and advantages derivable from the adoption of modern improvement, which, by-the-by, as regards some of them (curious enough) are only now finding their way into other establishments whose origin have not been altogether of yesterday's date. Here we have the nucleus of a concern that may, as time progresses, possibly rival that of our continental neighbours, the French, although whether we shall at any time award a like amount of scientific interest and inquiry to the pursuit of a commercial object is altogether another matter. Whether we shall ever conduct in our technical laboratories a class of work such as is carried out in those of the Paris Gas Company under the able directorship of its accomplished chemist and professor, M. Audouin, or appoint at their head men of similar talent and capacity, is also a matter of considerable surmise."

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 2181.—WORDSWORTH, C. T., Leeds, Yorks., "Improvements in gas motor engines." May 28, 1880.
 2227.—SPENCE, P., Manchester, "An improved method of purifying sewage." June 1, 1880.
 2282.—GLAZIER, C. L., and LORION, J., Manchester, "Improvements in the construction of apparatus for lighting gas, part of which apparatus is also applicable to other electrical appliances." June 1, 1880.
 2255.—SUGG, W. T., Westminster, "Improved apparatus for manufacturing illuminating gas." June 2, 1880.
 2242.—GLAZIER, C. L., and LORION, J., Manchester, "Improvements in apparatus used in the manufacture of gas." June 3, 1880.
 2265.—WILLIAMS, M., Wigan, Lancashire, "Improvements in methods of and apparatus for increasing the illuminating power of gas-flames." June 3, 1880.
 2271.—VATSON, J. W. S., St. Marychurch, South Devon, "Improvements in or relating to electrical illumination, and in apparatus connected therewith." June 3, 1880.
 2288.—ROBBINS, J., Uxbridge Road, London, "An improved joint for water and other pipes." June 5, 1880.
 2229.—LIVEST, J., Westminster, "Improvements in gas-motor engines." A communication. June 7, 1880.
 2337.—PHELPS, R., Birmingham, "Certain improvements in gasaliers and parts ordinarily used in connection therewith." June 9, 1880.
 2338.—WILSON, J. G., Manchester, "An improved construction of condensing gas-engine and boiler with automatic air or gas and water supply, also applicable to other steam generators or boilers." A communication. June 9, 1880.
 2344.—ROBINSON, H., Manchester, "Improvements in gas motor engines." June 10, 1880.
 2330.—HILDEBRANDT, J. A. R., Manchester, "Improvements in exhausters for gas or liquids." A communication. June 12, 1880.
 2422.—FOULS, W., Glasgow, "Improvements in gas-engines." June 15, 1880.
 2467.—KESELER, C., Berlin, "Improvements in apparatus for the production of lighting gas from gasoline and other light hydrocarbon liquids, also applicable for enriching other such lighting gas." A communication. June 18, 1880.
 2577.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in joints or couplings for pipes or tubes." A communication. June 24, 1880.
 2558.—MIDGLEY, J. W., Keighley, Yorks., "Improvements in apparatus for raising and forcing liquids, also applicable for regulating the pressure of liquids, gas, and steam." June 24, 1880.
 2536.—PHELPS, R., Birmingham, "Certain improvements in gasaliers and other like fittings known as 'slides or pendants.'" June 25, 1880.
 2604.—LAW, J., Minorca, "Improvements in lighting and heating apparatus." June 25, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

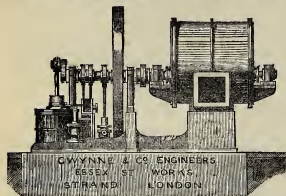
- 6102.—SNEEGROVE, H. R., Strand, London, "Improvements in the manufacture of gas and in apparatus therefor, and for carburetting and purifying gas." Dec. 18, 1879.
 5177.—MACKENZIE, J., Regent's Park, London, "Improvements in apparatus for lighting gas by electricity." Dec. 17, 1879.
 5367.—SUGG, W. T., Westminster, "Improvements in the construction of gas lamps or lanterns." Dec. 24, 1879.
 5275.—WILD, J., Huddersfield, Yorks., "Improvements in the method of and apparatus for regulating or controlling the pressure of gas, being also applicable for regulating or checking the pressure of steam, water, or other fluids." Dec. 24, 1879.
 5310.—BONNEVILLE, H. A., Paris, "Improvements in the manufacture of gas, and in the apparatus used therefor." A communication. Dec. 29, 1879.
 5323.—BULL, H. C., New York, U.S.A., "Improvements in the manufacture of gas and in apparatus therefor, and for other purposes." Dec. 31, 1879.
 17.—EVENSEN, P., Chancery Lane, London, "Improvements in and connected with steam and water jet motors, partly applicable to fluid-meters." A communication. Jan. 2, 1880.
 62.—SILBER, A. M., Whitecross Street, London, "Improvements in lamp or gas-stoves." Jan. 7, 1880.
 282.—SUGG, W. T., Westminster, "Improvements in the construction of gas-burners." Jan. 22, 1880.
 591.—POOCK, A. W., Wandsworth, London, "Improvements in meters for measuring liquids." Feb. 10, 1880.
 1055.—MILNMAN, J., Finsbury Park Road, and OWEN, R., Haverstock Hill, London, "Improvements in apparatus for regulating the supply of gas." March 11, 1880.
 1456.—LOWE, C., and GILL, J., Manchester, "Improvements in the manufacture of certain coal tar and residual products." April 9, 1880.

PATENTS WHICH HAVE BECOME VOID

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.
 2033.—LAKE, W. R., "Improvements in gas-meters." May 24, 1877.
 2069.—BRETT, R. W., "Improvements in lanterns for public or private lighting, and in the mode of supporting the same." May 28, 1877.
 2238.—NEWMAN, J., "Improvements in apparatus for transmitting gas from the retort to the hydraulic main." June 8, 1877.
 2417.—PAUL, E., "Improvements in and connected with pumps." June 22, 1877.
 2420.—COLSON, A., "Improvements in apparatus used in the manufacture of gas." June 23, 1877.
 2447.—POCKETT, W., "Improvements in gas apparatus for heating water or other liquids." June 23, 1877.

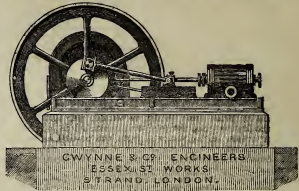
The GRAND MEDAL of MERIT at the VIENNA EXHIBITION. TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

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EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

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Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

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WITH
Wrought-Iron Spindles and
ENGINES COMBINED.

SOLE MAKERS,
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MAKERS OF ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[SEE ALSO ADVERTISEMENT, PAGE 33.]

Phoenix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of the NEW Edition,
"Cooking & Heating by Gas," on Burners, &c.
Copies, by post, Threepence, direct from the Author,
MAGNUS OHRÉN, Assoc. M.I.C.E., Gas-Works, STENHAM.

WANTED, by a Young Man (married),
a Situation in a Gas-Works. Is the son of a
Manager, and is a good Main and Service Layer. Can do
any Fittings in the Retort-House; also can Fix and Read
Indexes of Meters, and has had experience both at Lathes
and Vice. Very steady.
Apply to the MANAGER, Gas-Works, Crayford, Kent.

WANTED, by the Advertiser, a Young
Man aged 25, and Married, a Situation as
MANAGER of a small Gas-Works. Applicant has a
thorough knowledge of the Manufacture and Distribution of
Gas in all its branches. Has had several years ex-
perience as Manager of a Works (make 15 millions).
Has no objection to go Abroad. Satisfactory reasons for change.
Address No. 663, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

THE West Bromwich Improvement
Commissioners require an ACCOUNTANT CLERK
at their new Gas-Works, Albion, West Bromwich, to enter
on his duties at once. Applicants must thoroughly under-
stand Book-keeping, double and single entry, and must
have had experience in the Keeping of Gas-Works Accounts.
He will be required to devote the whole of his time to
the discharge of such duties. Salary £140 per annum.
Applications must be in candidates own handwriting,
stating age and qualifications, and must be sent with three
original testimonials, addressed to me at the Town Hall,
West Bromwich, on or before the 13th of July inst. Ap-
proved security in the sum of £500 will be required.
Chas. H. BATEMAN,
Clerk to the Commissioners.

Town Hall, West Bromwich, July 3, 1880.

STATION-METER (Second-hand)

Wanted, to pass 3000 feet of gas per hour.
Address SECRETARY, Gas Company, ALTYTH, N.B.

WANTED, two active and experienced
men as WATER-WORKS FITTERS to the
Luton Water Company. They must be able to Lay Mains,
Attach Lead and Iron Services, do Plumbing, and be well
up in Water-Works matters generally. They must be
steady, industrious men, and well recommended.
Apply, stating age, wages required, with other particulars,
to Mr. T. F. MIDGEMAN, Engineer and Manager,
Water Company's Offices, Luton, Beds.

PORTSEA ISLAND GAS COMPANY.
THE Company require the services of a
competent person to act as FOREMAN. He must
be skilled in the Manufacture of Gas, Purification,
Mechanical Work, and the general routine of a Gas-Works.
Wages to commence at £3 per week.
Applications, stating age, qualifications, accompanied by
testimonials, to be sent to me on or before the 8th of July.
S. B. DARWIN.

WANTED, a Second-hand Gas Tank
and Holder, 40 ft. diameter, to 10 ft. deep, in
perfect order, complete ready for erection.
Price to include delivery alongside ship, Liverpool or
London.
Tenders to be addressed No. 670, care of Mr. King, 11,
Bolt Court, FLEET STREET, E.C.

FOR IMMEDIATE SALE—Two Purifi-
ers, each 7 ft. 3 in. by 5 ft. 6 in. and 3 ft. 6 in. deep,
with wooden Sieves, Valve and other Connections, very
suitable for a small Gas-Works, where the make is from
3 to 4 million cubic feet per annum.
Further information can be received on application to
the MANAGER, Gas-Works, KILRHUBBIE, FORFAREHIRE.

FOR SALE—Single Gasholder, 158 ft. by
30½ ft. in good condition, to be taken out early next
year, and replaced by S. C. & Sons with a Treble Lift.
Excellent Guide Framing, consisting of 20 handsome
Columns and wrought-iron Girders. May be seen at work
at the Gas-Works, Portsea.
Particulars on application to S. CUTLER and SONS, Mil-
wall, LONDON, E.

ON SALE—The Cast-Iron Fire Doors,
Mouthpieces, Ascension, H, and Dip Pipes, Hy-
draulic Mains, &c., belonging to six settings of six retorts;
also One Station Meter to pass 8000 feet per hour (makers
West and Gresson).

The above are in capital condition, and can be seen at the
Gas-Works, Guildford. No reasonable offer refused.
Further particulars on application to Mr. LANEWORTH,
Gas Officer, Guildford.

THE Sheffield United Gaslight Company
OFFER for SALE the following lots of Retort-
House FITTINGS, which they are now taking down at
two of their Stacks—

54 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft.
6 in. by 18 in. by 15 in.
16 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft.
6 in. by 18 in. by 15 in.
4 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft.
6 in. by 18 in. by 15 in.
320 Cast-Iron Mouthpieces, D-shaped, 21 in. by 15 in.
100 Lengths 4 in. Cast-Iron Ascension-Pipes, straight,
7 ft. 6 in. long.
215 Lengths 4 in. Cast-Iron Ascension-Pipes, straight,
5 ft. 6 in. long.
50 Lengths 4 in. Cast-Iron Ascension-Pipes, curved,
2 ft. 6 in. long.
63 Lengths 4 in. Cast-Iron Ascension-Pipes, curved,
10 ft. 2 in.
40 Lengths 4 in. Cast-Iron Ascension-Pipes, straight,
5 ft. 10 in.
17 Lengths 4 in. Cast-Iron Ascension-Pipes, straight,
5 ft. 5 in.
451 Lengths 4 in. Cast-Iron H-Pipes.
506 Lengths 4 in. Cast-Iron Dip-Pipes.

The above apparatus has been in use up to a recent date,
and is adapted for re-erection.
The Company will be prepared to receive an offer for
the whole or any portion of the above, Price £4 per ton,
loaded into trucks at Sheffield.

Applications to be addressed to the undersigned.
THOS. ROBERTS, Manager.
Gas Office, Sheffield, March 25, 1880.

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TO CORRESPONDENTS.

T. W.—Thanks for information received. Must defer notice till next week.

H. V.—American newspaper accounts, such as that you send, are generally so "padded" with untruths and exaggerations as to make it impossible to notice them in the *JOURNAL*. We are, however, much obliged to you for forwarding the cutting.

SOCIÉTÉ TECHNIQUE DE L'INDUSTRIE DU GAZ EN FRANCE.—We have received the report, just published, of the meeting of the Société, held at Lille, on the 28th of June last year. It contains much of great interest to the gas profession, and we shall take an early opportunity of referring, in our *Talk*, to many of the subjects presented to, and discussed at the meeting.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

TO SUBSCRIBERS.

Subscribers who desire to avail themselves of the reduction in the subscription to the *JOURNAL* by paying in advance for the second half of the year 1880, are reminded that this can only be done during the present month.

Subscribers who have not paid their subscriptions for this, or for any previous year, are requested to remit the same forthwith to the Publisher, in order to prevent any interruption in the regular delivery of the *JOURNAL*.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 13, 1880.

Circular to Gas Companies.

THE disastrous explosion which took place in the neighbourhood of Tottenham Court Road on the evening of Monday, the 5th inst., with its sad results in the destruction of life and property, is of absorbing interest to the whole of the gas world. A full and exhaustive inquiry into the cause of the accident, and into all the circumstances attending it, will doubtless be held promptly; and we shall therefore confine ourselves this week, as far as possible, to a statement of the facts so far as they are known to us, reserving comment till we have heard the evidence which will be forthcoming.

It was a singular coincidence that at the time we were going to press with our last "Circular," containing as it did some remarks upon the liabilities of Gas Companies for damage caused by escapes of gas from street-mains, this unexampled illustration of the gravity of those responsibilities should have been just happening. Although this disaster is almost—and, in its terrible extent, quite—unexampled, yet it is of a class which is generally appreciated by gas engineers, and the avoidance of such accidents in the past is a tribute to the care with which their work has been done and

its contingencies provided for. Continually, both in the streets and on the works, it is necessary to shut off lengths of working mains, and cut out portions, in order to make connections. It is impossible to completely exhaust the gas from the sections thus made dead, and a mixture with atmospheric air within the explosive limit is the result while the work is being done. In such cases not only would the application of a light to an open pipe, as in the recent accident, before valves have been opened or bags withdrawn, cause an explosion, but the same effect would be produced by the using of overheated lead in the running of a joint, inflaming the yarn used in caulking. These are dangers which have been known to exist, and we repeat that the avoidance of harm from them says much for the care and watchfulness of those engaged in such work. The accident of last week resulted not from want of knowledge as to how to deal with dangerous conditions, but from absolute ignorance of the existence and presence of such conditions at the time.

The facts are, we believe, as follows:—The Chartered Gas Company have been making preparations this spring for supplementing the supply to their western and west central districts, by a direct connection with the main from their Beckett works. This was to be effected by laying a 36-inch pipe from Goswell Road, where it would be joined to, and obtain its supply from the 48-inch (Beckett) main, through Bloomsbury to a point in Howland Street, a little westward of Tottenham Court Road. Thence it connected an existing 36-inch pipe, which, we presume, is at present the principal supply main to that neighbourhood from the western stations of the Company. The total length of this connecting-link main was rather over two miles. For the purpose probably of expediting the work, it was laid in two sections by separate gangs of men, but both in the employment of the same contractors. One of these sections extended from Goswell Road to the east side of Tottenham Court Road in Bayley Street; the other, that in which the explosion took place, from Howland Street, down Charlotte Street, through Percy Street, and across Tottenham Court Road, to meet the first section. Our readers unacquainted with the district will be helped in following the direction of this main by reference to the sketch which we give elsewhere; and we will, if possible, furnish a more detailed plan with our next issue. The eastern section, that from Goswell Road, is about a mile and a half long; the other rather less than half a mile. Early in March last, the working main in Howland Street was cut, and a T-branch put in, the outlet looking down Charlotte Street. On to this outlet, which was flanged for the purpose, was bolted a 36-inch valve, made by Messrs. Westwood and Wrights. A few lengths of pipe were then laid from the valve, so as to carry the excavation clear of Howland Street, and avoid again interfering with its traffic, and the short length so laid was capped up and left. The laying of the main itself was then commenced from the Tottenham Court Road, under which thoroughfare it was carried at a depth, we believe, of about nine feet, so as to clear the pipes already in position, and also a pneumatic tube used by the Post Office authorities. By about the middle of May the laying of this section was completed, and a connection was then made on to the short length already referred to, so opening up the whole main to the valve which severed it from that which was charged with gas. When this connection was made it is said that the air in the short length was pure, showing no sign of the presence of gas, thus confirming the Company's Chief Inspector in his confidence in the soundness of the valve. It will thus be seen that for nearly two months this section had been finished; it was capped up at its eastern end, the paving of the streets was made good, and no doubt was entertained that the valve which had shut out the gas from the short length would do so equally securely from the longer one. Meantime the section from Goswell Road was being laid, and a few days before the accident it was completed ready for connecting. No junction had been made with a live main in this case, and when the work was tested the length was closed at each end by a cap. If we are rightly informed that a pressure of over twenty inches was put within this main, and that it was maintained for twenty-four hours with no appreciable loss, there could be no better testimony to the care and accuracy with which the work had been carried out. The western section was tested on the day of the accident by pumping air into it through a two-inch pipe at the Bayley Street end. We have not heard what the result was, but we assume that it was satisfactory, because the two lengths were to be joined on the following day. This is a question of much importance, as we shall point out farther on.

We have thus stated the history of this unfortunate main so far as we are acquainted with it down to the evening of the 5th inst., when preparations were being made to connect its two sections together. On that evening a foreman and two or three men remained on the work to cut out the joint round the cap, and remove it to make room for the short piece of 36-inch pipe which, with a collar, was to make the connection.

We now come to a portion of the story which reads just as though some adverse Fate had meddled in the matter. It will be borne in mind that all those who were engaged in the work were under the impression that both sections were equally *dead*. The foreman knew all about the valve, and that it had never been opened; he knew also that air had been blown into the pipe that day, which would remind him, if it were needed, that gas had not yet been turned on. Nevertheless, while two of the men were engaged in cutting out the cap, the foreman removed the gauge which had been used for testing, and which showed that there was no pressure in the main; then having detected no smell of gas, he struck a match, and applied it to the open half-inch pipe, with the terrible results which are detailed elsewhere. We do not say that the effects might not have been equally serious had the cap been removed and a light accidentally applied to the open main; but this does not diminish our difficulty in comprehending the action of the foreman. He is a man of much experience, and has a reputation for special intelligence. He knew that the main had not been charged, that there was no pressure in it, and that if there *was* any gas present it must necessarily be a cause of great danger; still, although smoking was prohibited as dangerous, he applied the light as a *precaution*. If the same man was employed in the eastern section, it will be interesting to know whether, before removing the cap from the end of that main, he acted in the same way, and if not, what suggested the unusual course which he unfortunately adopted.

The Company, through their Chief Inspector, Mr. Hersey, have suggested an explanation of the presence of gas in the main. Satisfied apparently that the valve was sound, they assumed that there was a fracture in one of the lengths of pipe, and that by way of this fracture gas had found entrance through the soil about it from one of the service-mains in the street, which must also have been broken. This theory would not, we are sure, have been started unless there was some good foundation for it, as the probabilities are hardly in its favour; but it is in relation to this theory that the proving of the main becomes of importance. If, when pressure was applied in the early portion of the day, no leakage was apparent, no air escaping, the difficulty will be great in understanding how gas could have found its way into it as suggested. On the other hand, if the result of the testing was to show that the main was not sound, a slight leak in the valve would explain it as readily as a fractured pipe, and we are thus driven back upon further evidence and upon probabilities, in judging between the two theories. Every effort will be used, we do not doubt, by all the parties concerned to find out the exact truth and all the truth in regard to this most sad occurrence; and that the truth will be made apparent is the more likely because—or so it seems to us—no party or person is interested in repressing it. How slight may have been the cause of this disaster will be realized by our readers when we mention that an escape into the main of less than one foot of gas per hour from the time when it was closed in the month of May, would be sufficient to charge it with the terribly explosive mixture which was present in it on the 5th of July.

Upon visiting the scene none can help being impressed not only with the terrible force of the explosion, but also with the comparatively small amount of personal injury caused by it. Deeply deploring the death of the two workmen, and the suffering of the others who were hurt, our wonder is that their number was not many times greater. The explosion found vent in seven different places, throwing up in all probably a hundred yards length of paving, in some cases hurling the great stones higher than the tops of the houses, from whence they rained down again into the street. Yet, so far as we are aware, not one passer-by was seriously injured. The houses which have suffered are damaged, we believe, less than their appearance would indicate. All had areas in front of the basement windows, and the force of the explosion was largely spent in throwing in these area walls. No settlement appears to have taken place with any of the walls of the houses proper, and we saw no cracks in them. The carrying of the main under the crowded thoroughfare of the Tottenham Court Road at an unusual depth probably avoided a far more terrible scene than any of those

which did occur. Even this, however, strikes us less forcibly than the escape from fire. When the valve in Howland Street was wrecked, the gas from the 36-inch main in that street had free way to escape unchecked. Even at this, the farthest extremity of the main, after vent had been found in six different places, the force was still great enough to drive portions of the valve through the back of the branch to which it was attached, almost severing the working main in halves. That there should not have been flame remaining of that which accompanied the explosion is in itself remarkable. Had there been, this great volume of escaping gas would have been converted into a vast column of fire, which would have endangered the safety of the whole neighbourhood. Willing hands, under the personal direction of Mr. John Aird, filled in the ruined pipe with clay, and so checked the flow of gas; but it was not till some seven hours after the accident that the main was safely cut off and the terrible danger removed.

One, and that not the least, of the evils resulting from this explosion is the vague alarm which it has created in the minds of a large number of people, and which the grossly ignorant and injurious comments of a "largely circulated" section of the daily press has done much to foster. The public has a right to expect that this sensational but alarming nonsense will be met, if possible, by a plain unvarnished tale of the occurrence and its causes, and in this we believe they will not be disappointed. Such a story will, we also believe, make it clear that some special circumstance in this case has caused the disaster—a circumstance which, in the experience of half a century, has not been encountered before, and which, having now been clearly apprehended, will be safely provided against in the years to come.

[Since the above was in type, we learn that last evening, in the House of Commons, the President of the Board of Trade, in reply to a question by Mr. Firth, stated that he had no authority to institute an independent inquiry into the circumstances attending the explosion; but that he had communicated with Dr. Hardwicke, the Coroner, and, with his approval, had appointed Mr. Vernon Harcourt, one of the Metropolitan Gas Referees, to act as his assessor at the inquest.]

What may be regarded as a most satisfactory meeting of the North British Association of Gas Managers was held at Perth last week—Mr. J. Robb, of Haddington, presiding. There was a large attendance of members, and the programme for the meeting was of so varied a character that the interest in the proceedings was thoroughly well sustained to the very end. In this place it is right to say a word in praise of the arrangements made by the new Secretary (Mr. David Terrace), a worthy successor—which is really saying a great deal—of Mr. Mackenzie, who, it may be remembered, after long service, retired last year from that office. A preliminary notice of the meeting will be found in another column, and our usual full report will appear in due course, when we may take an opportunity of calling attention to some of the salient features of the communications made to the Association. The only regrettable incident of the meeting was a digression from the programme so as to allow of a disquisition by Dr. Miller, of the Perth Academy, on "Heat: Its Mechanical Energy." The matter discoursed upon by the learned Doctor was such as could be obtained from any elementary book on physics, and it seemed a great pity—and in this we feel sure we shall be supported by the vast majority of those present—that the time of the meeting for close upon an hour should have been taken up by what, interesting as it was in its way, was not specially adapted to a gathering of gas managers, called to listen to the reading of a set of papers, any one of which would, with advantage, have borne fuller discussion than was accorded to it. This, however, by the way. We trust, as we expect, that next year's meeting in Glasgow, under the presidency of Mr. J. McGilchrist, will be as satisfactory as last week's was, with the sole exception noted above.

We are unable to see what good purpose can be served by the intended action of the Commissioners of Sewers of the City of London in lighting the main thoroughfares from Blackfriars to London Bridge by the electric light. The idea of this important "experiment" seems to have arisen with the Bridge House Committee, who proposed at first to adopt electric lighting for their three bridges—Blackfriars, Southwark, and London—and this project spurred on the Commissioners of Sewers to take the extended action above indicated. New Bridge Street, Queen Victoria Street—lately so magnificently lighted by The Gaslight and Coke Company with Sugg's burners—Queen Street, Chudside, King William Street, St. Paul's Churchyard, and Ludgate Hill, together with the City bridges before mentioned, will

soon, if the Commissioners have their way, be handed over to the sputtering carbons, *vice* gas relieved—to be called in when wanted. Taking this length of roadway in conjunction with the Victoria Embankment, where the Metropolitan Board of Works have been carrying on their "experiment" for some time past, the night wanderer in London will be enabled to walk or drive from Westminster to London Bridge by the magneto-electric light. Truly an imposing "experiment" this will be. But how much longer will these exhibitions of electric lighting be put before the public as "experiments"? An experiment is a proceeding taken with the object of obtaining information. But the electric light has been already tried within the precincts of the City, to say nothing of the proceedings on the part of the Metropolitan Board of Works, about which, of course, the City "Fathers" could not be expected to know anything. Hence, then, this need of further trial, or why call it a trial, more than in the limited sense in which all mundane things are undergoing probation? Perchance the Commissioners of Sewers have special and private means of acquiring information as to the wishes and desires of the population whose ways they keep, and have come to the conclusion that the Holborn Viaduct exhibition was so generally admired that the public want another like it. The public taste in matters of this kind is difficult to determine with exactitude, but it certainly appeared to us as though the aspect of Queen Victoria Street, under The Gaslight and Coke Company's government, was far more brilliant than the Viaduct under the conditions mentioned. Perhaps the City authorities are in doubt on this point, in which case, having, we presume, settled, as a necessary preliminary proposition, that the leading thoroughfares under their control require to be better lighted than at present, let them call upon The Gaslight and Coke Company to illuminate the main streets in continuation of the lines above mentioned, such as Gracechurch Street and Bishopsgate Street, Moorgate Street, and Fleet Street with the most improved form of gas-lamps. Then, after a year's experience of both systems, they will be in a better position to form a judgment on the whole question, and will, moreover, have had enough of "experiments" in street lighting, until some future advance in science shall have given fresh grounds to work upon. But, in respect of the present proposal, it is to be hoped that some attempt will be made to gauge the feeling of the public, who will eventually have to find the money, before a binding contract to light with electricity, or by other means, such a vast length of thoroughfare, at a cost equal to six or seven times that of gas, is entered into by the Commission. What we should like to know is whether the public really demand that the City streets should be lighted throughout the night six or seven times more brilliantly than at present; and, if so, whether they are willing to bear the consequent expense. Judging from our experience of some of the thoroughfares named, where during the greater portion of the night the solitary policeman may be seen in undisturbed possession of streets that in daylight teem with business life, the present street-lamps are quite sufficient, except, it may be, during a few hours in winter evenings. But if more light is really required, why confine the opportunity of supplying it to one system of lighting, and that not by any means universally favoured? The whole action of the Commissioners of Sewers in this matter is ill-considered and unnecessary, and if they are not appalled by the estimate of the cost of carrying out their proposal, it is to be hoped that, for once, sufficient public interest will be aroused as to their proceedings, to prevent the City being heavily taxed to gratify the experimental ardour of a few amateurs in street lighting.

The gas undertaking of the Ramsgate Local Board has had a very successful year's working. The price of gas in Ramsgate is determined, in accordance with a special clause in the Local Board Act, 1877, with reference to the disposable annual profits, which are divisible in equal moieties, one going to the district fund, and the other being returned to the consumers by way of rebate in the gas accounts due at the time when the annual statement of accounts is presented. In this way the selling price of gas, which stood at 4s. in 1879, is now 3s. 2d. per thousand feet. The public lamps are charged as nearly as possible at prime cost. The works are in first-rate order, and fully equal to the probable increased production for some years. The undertaking, it will be recollected, came into the possession of the Local Board in 1877, and according to the Chairman's statement at the recent meeting of the Board, there has been an increase of 41.5 per cent. in the quantity of gas sold since that time. Mr. W. A. Valon, the Engineer, is to be congratulated on his working results, which show a sale of 9563 cubic feet of gas per ton of coal carbonized, with a percentage of only 4.71 unaccounted for, and a fuel con-

sumption of 20.28 per cent. of the coke produced, while the residuals returned 50.63 per cent. on the cost of the coal. Thus it will be generally acknowledged that the Local Board and the gas consumers of Ramsgate have every reason to be satisfied with the manner in which their gas affairs are conducted.

The gas question in one of its many phases has asserted itself again in the Manchester City Council, where a desultory discussion arose last Wednesday respecting the manner in which the cost of street lighting is to appear in the accounts of the Gas Committee. The Committee intend that this item shall be made a direct charge in their own revenue account, instead of being charged to the city fund; but this proposal is opposed by many persons both within and without the Council. The Committee held their own, by a substantial majority, on this particular occasion; but, as we have repeatedly remarked, the administration of the Manchester gas undertaking is conducted altogether in accordance with peculiar principles, protected in a great measure by legislation belonging to the dark ages of local self-government, and such as is not likely to be repeated in modern times. Neither the Gas Committee nor their opponents are wholly to blame for the continual snarling which goes on in respect of this unsatisfactory system of management. The system itself is a growth of years, and will not be altered, much more uprooted, without much local disturbance. We do not, however, so much dis honour the spirit of true finance as to despair of seeing at some future time indirect municipal taxation eventually given up even in Manchester. Do we not remember with what zeal the reformers of the Manchester school of Free Trade have always attacked the unrighteous adherence to indirect taxation, of all benighted nations who have endeavoured to raise revenue by taxing imported cotton goods?—of course, in the interests of political economy only. Now, if there be any such ardent spirits in the body which confines itself to controlling local affairs, we would commend to their consideration the truth contained in the proverb which may be made to read, "Political economy—like charity—begins at home."

A truce has been arranged between the Corporation of Dublin and the Alliance Gas Company, who have so lately been at cross-purposes in the matter of street-paving and main-laying, the Corporation having accepted the Company's terms, which they had previously rejected. There should never have been any dispute, as the Company were clearly in the right from the first, and if this had been seen by the Paving Committee, much annoyance to the citizens would have been avoided.

From a bulky volume of statistical information concerning Glasgow, emanating from Mr. W. West Watson's (the City Chamberlain's) office, we gather that the Corporation gas undertaking is in a very satisfactory state. Glasgow gas is always maintained at from twenty-five to thirty candles illuminating power, and during the whole of the past year it was never observed to fall below the former figure; while the selling price is 3s. 10d. per thousand feet—an average of only 1.67d. per candle. Progress has not, however, always characterized the yearly statements of the Gas Committee. Thus, the production of gas for 1878 was less than that of the preceding year, but the past year shows a healthy recovery, the production having advanced sufficiently to make up in some measure for the previous falling off. Now the corner has been fairly turned, we may hope that a long time will elapse before the Gas Committee again have to chronicle a positive decrease in their business.

DEATH OF MR. F. J. EVANS.—After the announcement, in last JOURNAL, of the very serious illness of Mr. EVANS, our readers will not be unprepared for the news of his death, which occurred last Thursday at his residence, "Claydon's," Brentford, W. A biographical notice of the deceased gentleman is in course of preparation, and next week we hope to lay before our readers an account of his life and labours in the gas profession.

A GAS APPARATUS EXHIBITION FOR BELFAST.—From an announcement in our advertising columns to-day, it will be seen that the Gas Committee of the Belfast Corporation are arranging for an exhibition of gas-engines, stoves, ovens, burners, and other appliances for the economical use of gas. This will be held in the Grain Market, during the fortnight from the 16th to the 28th of next month; and, under the energetic superintendence of Mr. James Steifox, the Gas Engineer to the Corporation, the exhibition will doubtless prove an unequalled success.

In the Edinburgh *Journal of Artificial Light and Sanitary Gazette* for Saturday last appeared the announcement "that from this date its issue will be suspended." Rumours have been in circulation for some time past that such an occurrence was imminent; and we take this opportunity to inform our readers north of the Border that we shall now endeavour to devote more of our space to Scottish Gas Affairs, and ask their co-operation in sending us items of news that they consider will interest the gas profession generally.

Water and Sanitary Notes.

THE Select Committee on the Water Supply of London finished their examination of Mr. E. J. Smith on Tuesday last. On Friday, Mr. Allen Stoneham, the Auditor appointed under the Metropolitan Water Act of 1871, gave evidence, followed by Lieut.-Col. Bolton, the Water Examiner appointed under the same Act. Thus, in the course of four weeks, the Committee are as far as the third witness. Down to the present time the inquiry has been chiefly directed to the financial aspect of the scheme of purchase. The quality of the article to be bought has still to be considered. Lieut.-Col. Bolton has been questioned as to the state of the works, and although this witness is officially cognizant of the quality of the water, it is not unlikely that evidence at some length will be sought elsewhere on that point. The practicability of obtaining a supply from some new source has also been proposed for consideration. Possibly, seeing that the session is rapidly passing away, the Committee will adopt some expedient by which they will be enabled to present a report at an earlier date than can now be reckoned upon. Thus far, a more tedious inquiry than that which Sir W. Harcourt has initiated has seldom fallen to the lot of a Parliamentary Committee. The evidence given doubtless contains much that is valuable, but one honourable member complained that having perused the replies given by Mr. Smith to Mr. Philbrick, in reference to the back dividends, he "could not understand them." It will be the duty of the Committee to study and understand all the evidence; but it is to be regretted that the important subject to which it relates should come before Parliament in such a cumbersome shape. The Home Secretary has laid the basis of the inquiry on such a scale that great delay must arise in approaching the final issue, unless a short cut be made so as to get out of the difficulty. It would be a merciful act on the part of the Companies if they would offer some reduction in their terms, so as to make a golden bridge whereby Sir W. Harcourt might retreat.

It is a question for the Water Companies to consider whether it is of any use for the existing terms of purchase to remain under consideration, when it is so thoroughly apparent that in the opinion of the Committee these terms are extravagantly high. If there is no prospect of the terms being accepted, it might be better to withdraw them at once. Policy may perhaps dictate, on the other hand, the advantage of playing a waiting game. If Sir W. Harcourt chooses to amuse himself and wear out his Committee by fighting the terms of purchase, the Companies will have another year of life, and there is no saying what may transpire to benefit them. But if the Companies are themselves tired of the uncertainty which besets their undertakings, they had better seek to put the matter on a fresh footing, for, unless something of the kind is accomplished, the period of uncertainty threatens to be indefinitely prolonged. If any man is sick of this Committee, it must be Sir Richard Cross. Twice a week the terms of purchase negotiated under his auspices are stuck up to be shot at, and we should suppose that by this time nobody expects to see such terms finally adopted. The Committee may possibly be disposed to approve of the price in regard to one or two of the Companies, and would not be unwilling to recommend that a purchase be effected to that extent. But if the Committee did this in any other case than that of the Kent Company, they would be virtually approving of the present supply, which is hardly consonant with the notions of the Home Secretary. Altogether the inquiry is in a very unsatisfactory state. Its only practical issue appears to be that of showing that the terms of purchase negotiated by Mr. Smith are not sufficiently favourable to the public, and are not therefore to be recommended to Parliament.

There was something remarkable in the evidence of Lieut.-Col. Bolton. This gentleman stated that his first interview with Mr. Smith in reference to the purchase of the Water Companies undertakings was on Dec. 1, 1879, and that he did not present any report to Mr. Smith on the state of the works until January 20, and then only in reference to the Chelsea Company. According to the evidence of Mr. Smith, the pecuniary terms of purchase were practically settled by that date. Conversationally some information had been given to Mr. Smith before that period, but not in the form of a report. Such conversational information was not considered by Lieut.-Col. Bolton to be at all of a definite character, neither value nor terms being mentioned by him to Mr. Smith. In preparing his subsequent reports, Lieut.-Col. Bolton found that he was expected to go into an amount of detail which time would not permit, and altogether that he was to undertake a responsibility which it was out of his

power to accept. So strongly did Lieut.-Col. Bolton feel this, that on Feb. 4 he drew up a memorandum in the nature of a protest, and took it to the Home Office. Two days afterwards, Lieut.-Col. Bolton attended at the office of the Local Government Board, and was taken by Sir John Lambert to the Home Office, where he met Mr. Smith, Sir Theodore Martin, and the President of the Local Government Board. Mr. Smith then asked Lieut.-Col. Bolton to sign the following certificate, which he had prepared for his signature:—"I hereby certify that the plant and works of the eight London Water Companies are, to the best of my judgment and my opinion, in a fit and proper working condition." In reply to this request, Lieut.-Col. Bolton stated that he could not give such a certificate, for the reasons stated in his memorandum of Feb. 4. Thereupon Mr. Smith asked him to give a certificate in his own words, which Lieut.-Col. Bolton did. This certificate stated that an expenditure within £100,000 was necessary to rectify existing deficiencies. In evidence before the Committee Lieut.-Col. Bolton estimated roughly that the requisite outlay would be £60,000.

It is sufficiently clear that in a comparatively short space of time, though not until after the period when Mr. Smith had concluded his negotiations, Lieut.-Col. Bolton had succeeded in putting on paper a vast amount of information relative to the state of the Companies works. Still it was his opinion throughout that much more was wanted, and he advised Mr. Smith at the outset that a special report should be made upon the works of each Company by an independent professional engineer. To that opinion Lieut.-Col. Bolton still adheres, saying to the Committee: "Although this information is useful and general, still it is not the information which, in my opinion, would enable any one to arrive even at the approximate value of the works." We may suppose that Sir W. Harcourt will lay great stress on the circumstance that Mr. Smith made his bargain with the Companies without possessing precise knowledge as to the state of the works. It seems strange that nothing is said as to any arrangement being made by which this element of value should be properly considered when the time came for carrying out the purchase. The bargain might have been struck subject to any deduction afterwards shown to be necessary on account of defects in the works. If no such proviso existed, it is difficult to see what was the good of inspecting the works after the bargain was struck, as the examination in that case would only serve to show how much money the public authority would have to expend to make good the existing defects. The whole business was hurried, and was necessarily done somewhat "in the rough." It is easy now to be critical, and on some points the transaction will not bear very rigorous criticism. Mr. Smith believes he did well, but he fails to satisfy Sir W. Harcourt on that point, and the general current of public opinion is unfavourable to the contemplated bargain.

The evidence of Mr. Allen Stoneham, showing how many years purchase of the income are represented by Mr. Smith's terms, will not improve the prospect. The years were calculated by Mr. Stoneham to be as follows for the respective Companies:—Chelsea, 43; East London, 45; Grand Junction, 43; Kent, 42; Lambeth, 41; New River, 40; Southwark and Vauxhall, 43; West Middlesex, 31. We give the figures for what they are worth, but they must be used with caution, as they include the prospective increase, which varies greatly in the case of different Companies, and there are other complications. In the aggregate the immediate stock required to carry out the scheme would be £22,098,700, and the deferred stock £9,300,000, making a total of £31,398,700. Taking the present value of the deferred stock, the total becomes £29,734,281. A paper handed in by Mr. Stoneham shows that the income of the eight Metropolitan Water Companies, during the past year, in the shape of water-rates, was £1,427,818. Rents and extra receipts added £12,454, and interest £5255. On the other side, interest payable on loan capital amounted to £101,637, the dividends paid on preference capital were £42,677, and the dividends on share capital £676,062, while the losses on collection of water-rates were written off as £61,081. The expenditure for maintenance of works and for pumping was £254,671. Rates and taxes took £87,504, and commission to collectors £37,672. The total expenditure for works by the close of the year was £12,317,304, of which one-fourth appertained to the New River Company, and very nearly one-sixth to the East London. The total of ordinary share capital is £8,887,466. The preference capital is £875,050, the loan capital £255,365, and the debentures £2,238,550.

The special report of the Select Committee of the House of Commons on the Liverpool Corporation Water Bill states

that there seems to be sufficient reason why the Corporation should have preferred the Vyrnwy scheme to any project for taking water from the Cumberland Lakes, whether in connection with the Manchester aqueduct from Thirlmere, or from some other of those lakes. The Committee are also satisfied that the various interests affected by the scheme in the Severn Valley have been sufficiently guarded by the modifications made in the Bill, and that the effect on those interests will be salutary rather than otherwise, as regards the fishing, the navigation, and the effect of floods. The report goes on to state that the quantity of water to be abstracted from the Severn Valley by this scheme will not be sufficient to "interfere seriously with any plan which may hereafter be found expedient for the water supply of the town population in the Severn Valley, or even of the "Metropolis." The Committee have so far followed the precedent furnished in the case of the Manchester Water Act as to secure that facilities for future water supply should be afforded to the districts of Warrington, Widnes, and St. Helen's by the Corporation of Liverpool, under agreements. In the deliberations of the Committee, Sir John Lubbock brought forward a draft report differing from the foregoing, but it was only supported by himself and Mr. Blennerhassett. In the opinion of those two gentlemen, Parliament should have further evidence on certain points "before permitting Liverpool to take a supply of water 'so far out of her own natural area.'" Sir John Lubbock's proposals have reference to an arrangement such as that recommended by the Duke of Richmond's Commission, which reported that the northern lakes were "the best source of 'supply for the large and growing masses of population in 'the north and centre of England,'" and laid it down as being wrong in principle that any one town or district should take possession of the gathering-ground geographically belonging to another. Despite such considerations, the Worcester Town Council have expressed their satisfaction with the terms which they have obtained under the Bill, though a few members of that body consider that something more ought to have been gained. The Town Clerk, in acknowledging a vote of thanks on the subject, stated that Worcester would have a flow from the works of the Liverpool Corporation to the extent of ten million gallons a day, with a supply given monthly, which would make the actual daily supply 13,500,000 gallons.

At the annual meeting of the Sanitary Institute of Great Britain, held under the presidency of the Earl of Shaftesbury a few days ago, an interesting paper was read by Captain Douglas Galton, on "Some Preventable Causes of Impurity in London Air." It was remarked that very slight efforts had been made in the direction of purifying the air of towns from smoke. Lord Shaftesbury observed that while it was necessary for the mass of the people to be instructed in the principles of sanitary science, it was also necessary for engineers and architects to understand such matters more than they did at present. Concerning the latter, his lordship remarked that they seemed to know as little about sanitary arrangements, ventilation, and drainage as they did about the moon. Mr. Chadwick is reported to have said that all the doctrines propounded and elaborated by the Board of Health, upon which he worked with Lord Shaftesbury, had been carried out "somewhere." Was the reporter malicious or mistaken? At the anniversary dinner which followed the meeting, Commander Cheyne expressed the pleasure he felt in announcing that Dr. Richardson had undertaken to superintend the provisioning and equipment of the next expedition in search of the North Pole.

A deputation of millowners, woollen manufacturers, paper makers, and others from across the Tweed, recently waited on the President of the Local Government Board, representing that if the Rivers Pollution Act were carried out with increased severity during the next three years, it would almost have the effect of stopping certain manufactures in Scotland. In the course of his reply, Mr. Dodson said it was not improbable that before long the whole question of the pollution of rivers, as well as other sanitary matters, would have to come under consideration; but nothing could be done during the present session. Respecting the action of the manufacturers on this point, it may be observed that most of them require tolerably clean water to begin with, and if the pollution of rivers be not checked, they will be put to considerable trouble to fit the water for their own use. In other words, it may become a question whether it would not better answer their purpose to purify the water after using it, instead of having to purify it beforehand. It has also been understood that many manufacturers were willing to purify the water as it left their premises, providing the rule were made general.

Obviously it is a very discouraging task for a manufacturer to receive dirty water, and to be at the expense of sending it away clean. It is possible that some modification of the existing law may hasten the desired consummation. It seems only fair that a manufacturer, having used the river water, should be compelled to restore it to the river in the same state in which he received it. But it is unreasonable to demand that the water which leaves his premises should be purer than that which enters it. If he were required to send the water on to his next neighbour in identically the same state in which it came to him, there can be no doubt at all that the purity of the river would continually increase, while the burden of the expense would either remain the same or even become less. These remarks, however, have their limitation. They apply readily enough to manufacturers who make use of the river water for their several processes, and, having polluted it, discharge it into the stream. There are others who pollute the stream in a more highly artificial manner. Concerning these it may be contended that they are going beyond their rights in so carrying on their business as to render the stream unfit for use by their neighbours. Certainly, if there are means available by which such annoyance and damage can be avoided, those means ought to be employed, and in case of neglect there is good ground for a penalty. At all events, there must be some medium between the ruin of a river on the one hand, and the ruin of the manufacturers on the other.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

MR. NIVEN'S PAPER ON CORRECTIONS FOR TEMPERATURE AND PRESSURE.

Sir,—I must admit "a hit, a palpable hit," from Mr. Niven, who in his letter, in your last number, says: "The 'Manual' I have was published under the editorship of Mr. Hartley himself, in 1862; that is, five years after the publication of 'Bunsen's Gasometry,' in English, by Roscoe, which had the correct coefficient [for the expansion of gases] as finally fixed by Regnault." Mr. Niven then justly says that the duty of an editor is to indicate the most recently-established facts and principles. I plead guilty to the indictment, submit myself to the mercy of the court, and only say, "Please, your Honour, it is a long time ago, and a lot of people were just as wicked as I." Why, the Metropolitan Gas Referees, appointed in 1868, adopted Mr. Wright's table, and published it in their Instructions, continuing to do so until about two years since, when Mr. Vernon Harcourt calculated the new table, in accordance with Regnault's coefficient, and took aqueous tension also into account. It certainly did not occur to me that the differences between the old formula and the new were very important from a practical point of view; but the propriety of the Referees action in issuing the new table is beyond question, and the old table must now be regarded as obsolete.

I have pleaded guilty without hesitation, as the "prosecutor" shows such a kindly spirit, and evidently only desires, in the cause of truth, to compel a culprit to a confession.

Mr. Niven, commenting on the formula $17 \cdot 64 (h - a)$, says: "I take it for granted that no printer's 'devil' has been poking fun at the formula."

That he is wrong in his conclusion will be shown presently; but I must remark that a devil of some kind has played a sad trick with Mr. Niven's formula, for, as given, I find—

$$\frac{460 + t^{60}}{492 + 28} = \frac{460 + 60}{520} = 1;$$

which means $460 + t$ raised to its 60th power, divided by $492 + 28$, equals $460 + 60$ divided by 520. The product of t , even if this be taken as 2 only, misleads to its 60th power would come to mere figures, I fancy, than the printer of the JOURNAL would care to find; while its publication would scarcely be of interest. Of course Mr. Niven means $460 + (t = 60)$

Well, compositors, as well as "devils," play strange tricks, for the formula is given, unhappily, in most copies of my book as $17 \cdot 64 (h - a)$, instead of $17 \cdot 64 (h - c)$; although my proof sheets were correct. Mr. Niven justly objects to the compositor's blunder, for I am sure he is satisfied that the absurdity is not due to me any more than t^{60} can be due to him. The X in my book is so small that it was only very recently that I observed it—small type being scarcely so clear to me now as it was 20 years since.

Mr. Niven has analyzed the contracted formula—which in its correct form is due to Mr. Harcourt and not to me—so that I need make no further remark on this head than that although the formula as given is incorrect, the table is correct with, I think, one exception, where the compositor ingeniously contrived, after revision, to insert a 2 instead of a 9—to break the monotony, I suppose (29·8 inches and 72"). This is an error which can deceive no one.

It is a great pity that, in all such calculations as are now in question, the Centigrade scale is not universally employed, and the differences in gaseous volumes due to temperature calculated from the absolute zero. We should then get rid of the abominable 32° which have now to be taken into account on the Fahrenheit scale.

The appendix to my book is, I may state, issued with the book, as a pamphlet.

I cannot close this letter without expressing my deep sense of the

generous spirit which marks Mr. Niven's letter. Such letters lift controversy from the low level of mere bickering into that of intellectual enjoyment. Mr. Niven has set an example which is worthy of imitation. It is quite certain that he has been trained in a school where personal irritations are completely subordinated to the noble desire to give and to obtain knowledge. I thank him sincerely for the expression of his respect towards myself, and can assure him that I entertain as warm a regard towards him.

F. W. HARTLEY.

55, Millbank Street, June 30, 1880.

[We may state that Mr. Niven, and not the "poor compositor" this time, is responsible for the correctness of the letter published in last week's issue; a proof of it having been sent to our correspondent, and returned by him previous to its appearance.—Ed. J. G. L.]

SIR,—As a son of the late Alexander Wright (who some 30 years ago constructed a table of specific gravities of gases at different temperatures and under different barometric pressures), I beg to be allowed permission to make a few remarks upon Mr. Niven's criticisms, in his paper recently read before the West of Scotland Gas Managers Association, and given in the JOURNAL for June 1 (Vol. XXXV, p. 340), upon that table, and that more recently published by the Metropolitan Gas Referees.

At the time when Mr. Wright invented his table, there was not one scientific man able to contradict it, based as it was upon the accepted data of those days. Then it was agreed that a gas increases 1.450th part of its volume at 32° Fahr. for every degree of added temperature; but more recent researches by Regnault and others have shown that this rate of dilatation of gases should more properly be 1.492nd. Some three or four years ago you were good enough to publish a statement of mine to this effect, with a corrected formula for calculating a new table; and, if my memory is not at fault, you remarked that it was a pity I had not time for re-calculating the table. Last year, possibly on account of this statement of mine, the Gas Referees published a new table, calculated from the formula Mr. Niven quotes—

$$1.754 \frac{(t - a)}{460 + t}$$

I do not think I am wrong in attributing this formula, and the new table, to Mr. Vernon Harcourt, who is a high authority. This formula takes cognizance of the pressure exerted by aqueous vapour at varying temperatures (for coal gas is usually measured over water). Now, my father in his table ignored this, and justly so, I think, for his table was for the use of practical men, who would not care to be bothered by the highest scientific refinements. His table was, however, then beyond criticism for dry gases. If you will allow me, I will explain to your readers how the formula in ordinary use are arrived at.

In the first place as to pressure: By Boyle's law, the volume of a portion of gas varies inversely as the pressure, temperature being constant. Calling volume V and pressure P, the temperature being constant, the product of V P is constant. In the second place, as to temperature: By the law of Charles, thus stated by Clerk-Maxwell, the volume of a gas under constant pressure expands when raised from the freezing to the boiling temperature, by the same fraction of itself, whatever be the nature of the gas.

Here it would be well to call attention to the air thermometer, the action of which will, perhaps, explain to Mr. Niven some fact or principle in chemical physics of which he is apparently unaware, and will show him how the number 460 is obtained—a number which puzzles him exceedingly. The air thermometer has played an important part in thermodynamics, and has very much simplified the formulae for adjusting volumes of gas, under various conditions of pressure and temperature, to standard. The air thermometer is a tube of uniform bore, sealed at one end, and containing a column of dry air disconnected from the outer atmosphere by a short column of mercury, which moves freely with the changes of the contained air.

We will suppose the pressure on the column of air to remain constant during the following changes:—Conceive the air thermometer immersed in a mixture maintained at 32° Fahr., and the volume of the contained air to measure 1; then conceive the thermometer immersed in steam from water boiling under standard conditions, and according to Regnault the volume should now measure 1.3665, but probably 1.366. I adopt this last figure in preference to the former. The problem now is:—Taking freezing point at 32° (1), and boiling point at 212° (1.366), find the temperature expressed at the bottom of the tube by continuing the Fahrenheit scale to that point. A simple calculation will show that it would be — 460° Fahr. Let us shift the zero to the bottom of the tube and scale upwards on the Fahrenheit system, and the freezing point will consequently be on the new scale + 462. Temperature expressed on this scale is termed by scientific men absolute temperature.

The rule, then, for converting ordinary readings on the Fahrenheit scale to absolute temperature in Fahrenheit degrees is to add 460°.

The object now to be attained is to condense the laws of Boyle and Charles into one simple expression. Clerk-Maxwell neatly combines them in the following expression:—"The product of the volume and pressure of any gas is proportional to the absolute temperature." Let V, P, T, be the observed volume, pressure, and temperature on the absolute scale, and V° the volume at standard pressure P°, and standard temperature T° on absolute scale; then—

$$\frac{V P}{T} = \frac{V^{\circ} P^{\circ}}{T^{\circ}} \quad (1)$$

$$V^{\circ} = V \frac{P}{P^{\circ}} \frac{T^{\circ}}{T} \quad (2)$$

$\frac{T^{\circ}}{P^{\circ}}$ is a constant quantity, and if the standards be 30 inches barometer and 520° thermometer, the standard absolute temperature becomes 17.333, and the formula for dry gases

$$V P 17.333$$

T

But coal gas is usually measured over water; and if it be considered necessary to correct for the varying pressure exerted by water vapour at various temperatures, we must slightly modify the above formula, as Mr. Vernon Harcourt has done in the recent Gas Referees Instruc-

tions. The original formula can be used if it is understood that P represents the observed pressure minus the tension exerted by water vapour at the temperature T; and P° the standard pressure minus 5178, which is the tension of water vapour at the standard temperature 520° (460° + 60°).

The Gas Referees formula (preserving the symbols) is—

$$V^{\circ} = V \frac{P - 520}{T - 5178} = V \frac{P}{T} \frac{1764}{492}$$

Mr. Niven's formula is useless, for, firstly, it does not apply to changes of pressure; and, secondly, it is wrong, as I will prove.

The second reason remains to be proved. Owing to the rather hairy form of the problem, I could not at first detect where Mr. Niven had been led into an error, which I shall shortly point out. Let us first take his own example: "1000 feet at 50° Fahr., what is the volume at 60° Fahr.?"

$$\frac{1000 \times 502}{492} = 1020 \text{ feet.}$$

If I might be allowed to extend the answer to the nearest first decimal, the answer will be 1020.3 feet. An old edition of Fowne gives the answer to the same problem as 1019.6 feet. The formula I give above for dry gases also gives 1019.6 as the answer. The following reasoning from Fowne will elucidate the difference:—"The rate of expansion is 1.460th of the volume at 0° for each degree; or 460 measures at 0° become 461 at 1°, 462 at 2°, 460 + 50 = 510 at 50°, and 460 + 60 = 520 at 60°." Hence—

$$\begin{array}{cccc} \text{Meas. at } 50^{\circ}. & \text{Meas. at } 60^{\circ}. & \text{Meas. at } 50^{\circ}. & \text{Meas. at } 60^{\circ}. \\ 510 & : 520 & = & 100 : 101.96 \end{array}$$

It will be seen that Mr. Niven has fallen into the singular error of taking the rate of expansion at 1.492nd of the volume at any temperature whatever, whereas the rate of expansion varies with the temperature at which the volume is measured.

Mr. Wright's table has, I believe, been used by every gas tester in the country for many years, and by the Gas Referees to within a very recent date, saving vast labour to all concerned in gas manufacture, and it is doubtful whether but for him any such table would be in use. Now that the coefficient of dilatation of gases has been altered, the table is to be contemptuously kicked out of office without a word of gratitude for long service, because the extreme ends of the table vary 12 per cent. from modern data. Are photometer testings to be trusted to within 12 per cent.; or station meters, are they equally to be trusted? I can assure Mr. Niven that Mr. Wright and Mr. John Inman, M.A., who published a mathematical investigation of Mr. Wright's formula, and Mr. Vernon Harcourt, M.A., thoroughly understood the subject. "This goes without saying."

In justice to the memory of Mr. Alexander Wright (who died just about the time when Regnault's researches were published), I trust you will publish this explanation.

LEWIS T. WRIGHT.

Beckton, June 30, 1880.

LIEGEL'S REGENERATOR FURNACES.

We have received from Herr A. Kloeene, of Dortmund, a letter, of which the following is a translation:—

SIR,—While staying in London lately I noticed in the JOURNAL of the 22nd ult. two drawings of furnaces which are there called "Liegel's Regenerative Furnaces." Permit me to say that these furnaces do not properly belong to the class of gas generators; they are simply what may be called "open fires."

Referring specially to the drawings, I beg to say that as far as Fig. 1 is concerned, this furnace, with the exception of the grate, is an exact copy of one of those of my earliest construction, which I abandoned long ago.

Fig. 2 is to some extent a copy of my latest improvement in gas furnaces, which has been much approved of, and is largely adopted in Germany, though the arrangement represented does not contain its principal advantages.

A. KLOEENE.

Dortmund, July 1, 1880.

[On receiving the drawings which have been promised us by our correspondent, we shall take at an early opportunity of placing them before our readers.—Ed. J. G. L.]

MR. METHERVEN'S TEST FOR ILLUMINATING POWER.

SIR,—I beg to submit a few tests which I have taken on Mr. Hartley's improved photometer, using an extra experimental meter to measure the gas consumed, a slice of which equals two candles. On each end of the rail is fixed one of Sugg's 15-ho 16-candle Argand burners, with a 7-in. by 2-in. chimney. The centre of the slice fixed on my left hand is 2 inches above the perforated face of the Argand, and 1½ inches from the side of the chimney.

No. of Test.	Gas consumed during Ten Minutes, slice out of grate equals 40 Grains.	Average of Ten Observations, one taken each Minute.	Gas consumed during Ten Minutes.	Reduced to Standard Candles.
1	729 cubic feet.	13.97	1.012 cubic feet.	23.00
2	" 883 "	12.06	" 769 "	26.10
3	" 457 "	9.05	" 889 "	16.95
4	" 888 "	10.47	" 674 "	26.85
5	" 908 "	12.54	" 685 "	23.60
6	" 576 "	8.56	" 857 "	16.05

Candles cannot be kicked out as the standard for testing the illuminating power of gas in the face of such possible irregularities as these.

July 8, 1880.

W. LYON.

MR. W. ROMANS, lately with the Sheffield United Gaslight Company, was last week selected, out of 80 candidates, for the post of Gas Manager at Rochdale, vacant by the appointment of Mr. T. O. Paterson to the engineering of the Birkenhead Corporation Gas-Works.

FARNBROOK GASLIGHT AND COKE COMPANY, LIMITED.—A Company which was registered on the 1st inst. with a capital of £3900, in 830 shares of £10 each. The Company was originally constituted by deed in 1835.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.

SESSION 1890.

PROGRESS MADE TO SATURDAY, JULY 10.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Ackworth, Featherstone, Purston, and Sharlston Gas Bill	Lords	Comas. Bill	June 25	July 5	..	..	..
Birkenhead Borough Bill	Commons	Feb. 9	Feb. 10	March 8	June 15	June 24	..
British Gaslight Company, Limited (Staffordshire Potteries), Bill	Lords	Feb. 10	Feb. 10	Feb. 23	June 17	June 22	..
Burton-upon-Trent Corporation Bill	Commons	Lords Bill	June 24	July 5	..	..	..
Cardiff Water Bill	Commons	Comma. Bill	May 27	July 5	..	..	..
Chester Gas Bill	Commons	Feb. 9	Feb. 10	Feb. 16	March 11	May 25	..
Cork Gas Bill	Lords	Feb. 10	Feb. 10	Feb. 20	March 8	March 11	June 29
Cork Improvement Bill	Commons	Lords Bill	March 11	May 31	June 11	June 15	..
Dagenham and District Farmers (Optional) Sewage Utilization Bill	Lords	Comma. Bill	March 12	March 19	June 4	June 8	June 29
Dartford Gas Bill	Commons	Feb. 9	Feb. 10	Feb. 24	March 2	March 11	..
Dearne Valley Water Bill	Commons	Feb. 9	Feb. 10	March 1	June 18	..	..
Denton and Haughton Gas Bill	Commons	Comma. Bill	June 25	July 5	..	..	..
Doncaster Corporation Water Bill	Commons	Feb. 10	Feb. 10	Feb. 16	June 15	June 24	..
Eastbourne Gas Bill	Commons	Lords Bill	May 23	June 8	June 22	June 25	..
Edinburgh and District Water Bill	Commons	Comma. Bill	June 27	June 8	June 24	June 25	July 9
Exmouth and District Water Bill	Lords	Feb. 9	Feb. 10	Feb. 23	March 12	May 25	..
Gaslight and Coke, Commercial Gas, and South Metropolitan Gaslight and Coke Companies Bill	Lords	Feb. 10	Feb. 10	Feb. 16	Feb. 26	March 2	June 14
Great Yarmouth Water Bill	Commons	Comma. Bill	March 5	March 15	June 1	June 10	..
Hinckley Local Board Gas Bill	Lords	Feb. 9	Feb. 10	Feb. 23	June 11	June 24	..
Huddersfield Tramways and Improvement Bill	Commons	Feb. 9	Feb. 10	Feb. 17	July 9	..	..
Hull Lighting Bill	Lords	Comma. Bill	July 6	..	..	..	..
Hyde Gas Bill	Commons	Feb. 9	Feb. 10	March 1	June 25	July 5	..
King's Lynn Corporation Bill	Lords	Comma. Bill	July 8	March 8	June 29	July 8	..
Lancashire County Justices (Water, &c.) Bill	Lords	Comma. Bill	June 23	July 5	July 8	..	..
Lancaster Corporation Bill	Commons	Feb. 9	Feb. 10	Feb. 16	June 14	June 24	..
Lincoln Gas Bill	Lords	Comma. Bill	June 29	July 9	June 11	June 28	..
Liverpool Corporation Water Bill	Commons	Feb. 9	Feb. 10	Feb. 16	June 14	Preamble	not proved.
Liverpool United Gas Bill	Lords	Comma. Bill	July 6	..	..	..	..
London Gaslight Company Bill	Commons	Feb. 9	Feb. 10	Feb. 16	June 9	July 5	..
Maldstone Gas Bill	Lords	Comma. Bill	Feb. 10	Feb. 16	June 11	June 13	June 29
Malton Gas Bill	Commons	Lords Bill	March 16	June 7	June 15	June 24	..
Oldham Improvement Bill	Lords	Comma. Bill	June 18	June 28	July 6	July 9	..
Phoenix Gaslight and Coke Company Bill	Commons	Feb. 9	Feb. 10	Feb. 16	March 12	June 18	..
Portmadoc Water Bill	Lords	Comma. Bill	June 22	July 6	June 8	June 21	..
Prescot Gas Bill	Commons	Feb. 9	Feb. 10	March 12	June 8	June 21	..
Preston Improvement Bill	Lords	Comma. Bill	July 8	..	..	..	..
Rathmines and Rathgar Township (Vary Water Supply) Bill	Commons	Feb. 9	Feb. 10	Feb. 24	July 1	July 8	..
Rathmines and Rathgar Township Water Bill	Lords	Comma. Bill	May 28	June 7	June 24	May 27	..
Reading Gas Bill	Commons	Feb. 9	Feb. 10	March 12	May 27	..	..
Rochester Corporation Bill	Lords	Comma. Bill	Feb. 10	Feb. 16	June 8	June 23	..
Sea Water Supply to London Bill	Commons	Feb. 9	Feb. 10	March 8	June 11	June 24	..
Sligo Borough Water Bill	Lords	Comma. Bill	July 6	Feb. 16	June 17	..	..
South Metropolitan Gas Company Bill	Commons	Feb. 9	Feb. 10	Feb. 16	June 17	July 5	..
Southwark and Vauxhall Water Bill	Lords	Bill with- drawn.	..	..	..	..	..
Stafford Borough Bill	Commons	Feb. 9	Feb. 10	..	..	..	..
Wakefield Corporation Water Bill	Lords	Bill with- drawn.	..	..	..	..	..
Wandsworth and Putney Gas Bill	Commons	Feb. 9	Feb. 10	Feb. 23	..	..	..
Wigan Improvement Bill	Lords	Comma. Bill	June 3	July 1	July 5	July 9	..
Wrexham Water Bill	Commons	Feb. 9	Feb. 10	Feb. 23	March 17	..	..
Yeadon and Gisleley Gas Bill	Lords	Comma. Bill	Feb. 10	Feb. 16	March 11	March 16	July 9
"	Commons	Lords Bill	March 18	June 7	June 25	July 7	..
"	Lords	Comma. Bill	June 25	July 5	July 6	..	..
"	Commons	Feb. 9	Feb. 10	March 2	June 8	June 24	..
"	Lords	Comma. Bill	June 25	July 5	..	..	..
"	Commons	Feb. 9	Feb. 10	Feb. 17	June 11	June 24	..
"	Lords	Comma. Bill	June 22	July 2	June 11	June 21	..
"	Commons	Feb. 10	Feb. 10	March 4	..	..	..
"	Lords	Comma. Bill	June 25	July 5	..	..	..
"	Commons	Feb. 9	Feb. 10	March 10	June 11	June 22	..

HOUSE OF LORDS.

TUESDAY, JULY 6.

Petitions against the Hull Lighting Bill were presented from (1) Sutton, Southcates and Drypool Gas Company, (2) Kingston-upon-Hull Gaslight Company.

THURSDAY, JULY 8.

The Ackworth, Featherstone, Purston, and Sharlston Gas Bill, the Preston Improvement Bill, and the Wigan Improvement Bill were referred to a Select Committee, consisting of Earl Camperdown (Chairman), Viscount Leitch, Lord Cavendish, Lord Hatherton, and Lord Halden; to meet on Tuesday, July 13.

GAS AND WATER ORDERS CONFIRMATION BILL.—The opposition to the Holywell Gas Order was withdrawn.

FRIDAY, JULY 9.

LOCAL GOVERNMENT (GAS) PROVISIONAL ORDER BILL.—This Bill received the Royal Assent by Commission.

GAS AND WATER ORDERS CONFIRMATION BILL.—This Bill was reported without amendment.

HOUSE OF COMMONS.

MONDAY, JULY 5.

A petition against the British Gaslight Company, Limited (Staffordshire Potteries) Bill was presented from the Corporation of Hanley and consumers of gas in the district.

A requisition to withdraw their petition against The Gaslight and Coke, Commercial Gas, and South Metropolitan Gaslight and Coke Companies Bill was presented from the Metropolitan Board of Works.

FRIDAY, JULY 9.

PROTECTION FROM FIRE IN THE METROPOLIS.

Sir H. SELWYN-IBRETON asked the Under-Secretary of State for the Home Department if he could assure the House that, before coming to any decision on the result of the inquiry now going on before a Committee of the House on the question of the Water Supply of London, the Government would consider the report of the Fire Brigade Committee of 1876, and the recommendations contained in their report for the better protection of life and property from fire in the Metropolis.

Mr. PREL said that, whatever might be the result of the pending inquiry into the Water Supply of London, the question of the supply for extinguishing fire must be involved in any decision that might be finally come to. The Metropolitan Fire Brigade Committee, over which the honourable baronet presided, reported in 1877, and among their principal conclusions were recommendations for the transfer to the Police of the duties of the present Fire Brigade, and for the amalgamation in one authority of the Water Companies. The transfer of the Water Companies to a public authority or Water Trust, was the very question which was now being considered by the Committee of which his right honourable friend the Secretary of State was Chairman, and their recommendations must necessarily be a primary consideration in connection with the Water Supply of the Metropolis. In any case, he could promise the honourable baronet that the recommendations of the Committee over which he presided should receive the attention to which they were eminently entitled.

THE GAS EXPLOSION IN TOTTENHAM COURT ROAD.

Mr. FIRTH gave notice that on Monday, July 12, he would ask the President of the Board of Trade whether the Board have jurisdiction to institute an inquiry into the causes and circumstances of the recent gas explosion in Tottenham Court Road; and, if so, whether it is their intention to institute such inquiry.

HOUSE OF COMMONS COMMITTEE.

TUESDAY, JUNE 15.

(Before Mr. DODDS, Chairman; Mr. SCHREIBER, Mr. J. MCARTNEY, and Mr. NORTHCOKE; Sir JOHN DREWRYN, Referee.)

MAIDSTONE GAS BILL.

Mr. POPE, Q.C., Mr. LITTLE, Q.C., Mr. MICHAEL, Q.C., and Mr. CHANDOS LEIGH appeared for the promoters; Mr. CLERK, Q.C., Mr. DUGDALE, and Mr. KINGSFORD for the Corporation of Maidstone, petitioners against the Bill.

Mr. MICHAEL, in opening the case for the promoters, said the Maidstone Gas Company were incorporated in 1823, but the Act under which they were at present supplying gas was obtained in 1858. The capital of the Company was divided into three classes of shares—first, £12,500 A shares, entitled, if it could be earned, to a dividend of 10 per cent.; secondly, £12,500 B shares, only entitled to divide 4 per cent.; and thirdly, by the Act of 1858, the Company obtained power to raise £25,000 at 7½ per cent., making a total of £50,000, with borrowing powers of one-fifth that amount—viz., £10,000. The illuminating power was fixed at 12 candles, and the maximum price at 6s.; a public lighting clause was also introduced by which the Local Authority were to be charged the lowest average price, and there was an arbitration clause in case of difference. The limits of the Company were 3 miles from the Town Hall, and they had power to take land not exceeding 6 acres. The population of Maidstone in 1851 was 20,801, while at present it was 30,000, and the rateable value was £106,000. The Company now proposed to take, by agreement, a small piece of land contiguous to the existing works, and situate on one side to the South-Eastern Railway, and also with facilities to get to the River Medway. They proposed to alter their limits to 4 miles instead of 3; and also to consolidate their capital into one of 7 per cent., in order to avoid the difficulties of working out the dividend on all the various shares, but imposing no new burden upon the consumers, because they proposed a uniform 7 per cent. It was also proposed to raise a further capital of £80,000 with borrowing powers to the extent of £20,000. In order to prevent the injustice to the urban part of the district by supplying gas in a radius so far off as 4 miles at the same price, the Company proposed to charge 1s. per 1000 feet extra beyond 3 miles in an economy of the expense, and would also ensure a profit which would go towards reducing the price in the borough. They also objected to the proposed capital; but this was a thing with which the gas consumers had nothing to do, owing to the operation of the auction clauses. It had very often been alleged, but never proved, that gas companies improperly expended capital on the Company were anxious to carry on their undertaking in the best possible way in the interests of the Share-

holders; but if they expended capital unnecessarily, they diminished the value of their property, and therefore the dividends paid to the Shareholders. The petitioners also objected to the standard price proposed in the Bill, and said that "if the price were fixed at 4s. with the sliding scale, as proposed in the Bill, the Company would, at the present price charged for gas in the borough, make a dividend of 9½ per cent. instead of the dividend of 7 per cent. now paid." This was based on an utter fallacy. They had gone upon the difference between the present price of 3s. 3d. and 4s., which was a difference of 9d., and then they had added 2½ per cent. to the 7 per cent., and made it 9½ per cent., as if that were the only amount of capital which was going to be influenced. Then they said that the Bill did not provide for the allowance of discounts to large consumers; but only the previous day a case occurred where the Local Authority contended for exactly the opposite. So the whole thing amounted to an absurdity, and the Corporation did not seem to have mastered what was the operation of the sliding scale. They had also objected to the proposed capital, and large discounts and rebates, and made it to the interest of the Gas Company to charge the lowest price. The petition next alleged that the Bill ought to limit the amount and application of the reserve-fund, which it did not do; but this was a total misapprehension of the working of that fund, which was an amount put by for the equalization of dividends, and belonged in reality to the Shareholders. The Corporation then objected that an illuminating power of 14 candles was not high enough, and that it ought to be 16 at the least. If they were willing to pay 3½d. extra for 16 candle gas they could have it. In two-thirds of the empire 14-candle gas was thought sufficient; and that at Maidstone was the case. The petition must be paid for. For heating purposes, however, 14-candle gas was more suitable than 16, and it would be much better for the general consumer to have the former at a lower price than the latter at a higher price. The next statement was, "That with respect to purity the Bill ought to provide that the gas manufactured by the Company should be of the greatest purity, and free from sulphur and hydrogen." This was a totally unnecessary allegation, seeing that the Gas-Works Claus Act of 1871 imposed this obligation upon the Company, that the gas "should not contain more than 20 grains of sulphur in any form in 100 cubic feet." Witnesses would be called on this point, and they would prove that to carry out this limitation would be a great difficulty. There were only two or three companies in the country, excepting the London Companies, who were limited with respect to sulphur; at the same time, if the Corporation wished it, the Company were perfectly willing that the Committee should insert in the Bill a reasonable quantity of sulphur which should be allowed in the gas. That was the only case asked for. The petition also alleged that gas should be tested might be between nine o'clock in the forenoon and eleven in the evening; that the testing-place should be the public baths in the borough; and that the test might be made without two hours previous notice to the Company as proposed by the Bill. Very reasonable requests were given, and the Corporation were desirous that requests should be granted. In the first place, the times mentioned were absurd, because during the day there was a very small amount of pressure, and it was in the evening that it was essential the testing should take place. With regard to the two hours notice, it appeared as though the petitioners thought the Company were during this time some time in doing the work, and making a representation improperly that usually supplied. It was, however, found necessary that two hours notice should be given, as it was essential that some of the officers of the Company should be at the place of testing, in order to avoid the difficulties which might arise owing to conflict of testimony. That was really the whole of the petition, and the gas should be tested into two or three points which the Corporation might have settled with the Gas Company, without the trouble and expense of appearing before the Committee. The promoters were still willing to make any concessions which were fair and just, and were prepared, even at that moment, to limit the gas to anything the Corporation might require. Evidence would now be called to prove that what was asked was not only in the interest of the Company, but also in the interests of the consumers, and that it was essentially necessary in order to enable the Company to fulfil the obligations Parliament had placed upon them.

The following witnesses were then called:—

Mr. Edward Hoar, examined by Mr. CHANDOS LEIGH.

I am Clerk to the Maidstone Gas Company, which was originally established in 1823, although they first obtained parliamentary powers in 1858, and from that time till now no application has been made for additional capital. The amount authorized by the Act of 1858 was £50,000, and £10,000 borrowing powers, the whole of which has been raised, and in addition the bankers account has been overdrawn to the extent of between £4000 and £5000. The present population of Maidstone is about 30,000, and the number of inhabited houses about 5500. The limits of the Act include the parish of Maidstone, and also the district within three miles of the Town Hall, and certain other places named in the Act. The rateable value for poor-rate is £106,000. The maximum dividend on the present share capital amounts to £3625, which is at the rate of 7½ per cent. on the £50,000. We propose to convert this capital into stock, carrying a uniform dividend of 7 per cent., which would be equal to £51,785. We have found three classes of shares an inconvenient system, and propose by the present Bill to consolidate them into one stock, bearing a uniform dividend. The price of the gas in Maidstone is the lowest in the county of Kent, with two exceptions—viz., Rochester and Canterbury. Beyond the radius of three miles from the Town Hall of Maidstone there are several minor towns or villages, which are supplied from small gas-works at each place, but we propose supplying gas in bulk to those places, and the price of gas in bulk is 10s. 6d. per 1000 cubic feet, and the charge for gas is 7s. 6d. per 1000 cubic feet, and the consumption 1,026,500 feet; West Mallon consumes 2,430,000 feet at 6s. 6d.; at Waterbury I do not know the amount, but the price is 9s. Those small companies have signified their willingness to take our gas in bulk. The maximum price under our present Act is 6s. per 1000 feet, and the illuminating power 12 candles, although we are supplying 14 candles and upwards.

WEDNESDAY, JUNE 16.

Mr. Hoar recalled, and cross-examined by Mr. DUGDALE.

Our proposal is to sell gas to the gas-holders in the small towns and villages. The Maidstone Company have been paying their full dividends whilst they have been overdrawing their bankers account; but I cannot answer the question why they did not pay their debts before they paid their dividends. At the present time the shares are bought to pay about 15 per cent. in the rough.

By the COMMITTEE. I cannot answer any questions with regard to the accounts of the Company.

Mr. LITTLE said there had been some negotiations which he hoped would have had the effect of shortening the inquiry. The promoters were anxious to make certain, and would also ensure a profit which would go towards reducing the price in the borough. They also objected to the proposed capital; but this was a thing with which the gas consumers had nothing to do, owing to the operation of the auction clauses. It had very often been alleged, but never proved, that gas companies improperly expended capital on the Company were anxious to carry on their undertaking in the best possible way in the interests of the Share-

The CHAIRMAN: I think 20 grains are proposed.
Mr. LITTLE said this was so. The Company, however, were willing that the standard price should be 3s. 10d., and the illuminating power

15 candles. They were also willing to agree that, if they were allowed 25 grains of sulphur in the winter, they would limit themselves to 80 grains in the summer, there being a difference between the standards of the inner and outer rings. As that offer was not accepted, the Committee would have to decide whether the Company ought even to accept a price of 4s. per 1000.

Mr. DUGDALE (in reply to the Chairman) said those were not the only points in dispute. There was a question of capital and limit of district; also of the place and time of testing, and the limitation of the reserve-fund.

Mr. LITTLE said any place of testing might be fixed that the Committee thought reasonable. The reserve-fund came out of property which might have been divided. With regard to capital, there were the auction clauses, and therefore he should scarcely have imagined that this would be a question for the Corporation. The Gas Company desired to be friendly with the Corporation, and therefore made them a liberal offer for the sake of friendship.

Mr. DUGDALE said he was afraid the case must go on.

Mr. LITTLE thereupon said the Company withdrew their offer, and the Corporation must take the consequences.

Mr. William Lawrence, examined by Mr. LITTLE.

I am one of the Directors of the Maidstone Gas Company, and am a large consumer of gas at my business premises. At Hollingbourne, where I reside, there are some small gas-works owned by a Company not under partnership with Mr. Dugdale. Our consumption is about 100,000 cubic feet a million feet per annum, and the price 7s. 6d. per 1000. We cart coals out of Maidstone at a cost of 8s. per ton. It would be a great advantage if we could be supplied in bulk from Maidstone, as we should be able to reduce the price, and also obtain gas of a superior quality.

Cross-examined by Mr. DUGDALE. Our present laying down a main to join Hollingbourne to the Maidstone Company would be about £400 or £500.

Mr. Ambrose Ward, examined by Mr. LITTLE.

I have been Chairman of the Maidstone Gas Company for the past 15 years. During the last few years our works have been largely increased, but are now inadequate to meet the demand for gas, and it is therefore necessary to have more land and more capital. About 7½ acres of ground have been privately bought for 5000 guineas, and this will be transferred to the Company when they have power to take it. [Witness pointed out the position of the land on the map.]

Examination continued by Mr. MICHAEL. We have recently erected a new retort-house, to contain 172 retorts, fitted up with West's patent machinery, which enables gas to be readily and economically made. It is also indispensable that we should have at once a new gasholder, which will cost about £1000 to £1200. We likewise require a governor-in-charge and other offices, and stables, and a covering for an exhaustive engine. We have had an application from Waterbury for a supply of gas. I consider that an extension of the limit of supply to four miles could be carried out without any injury to Maidstone. The conversion of capital into stock would be for my own comfort, and would not affect anyone outside the Company. The standard price proposed is 7s. 6d. per 1000 feet of gas at the radius. I do not think it right that there should be a series of discounts, neither do I think it would work well. We have always endeavoured to carry out our obligations to the consumers in a liberal manner, and have always supplied better gas than is required by Act of Parliament; we have likewise reduced the price from time to time. We did not earn our maximum dividend last year, but made up the deficiency from a small balance we had in hand.

Cross-examined by Mr. DUGDALE. Last winter we had only storage capacity for 440,000 cubic feet, and our make is 800,000 cubic feet per day. It is a fair calculation that there should be gasholder room enough for a day's consumption. We were obliged to keep making gas, instead of having it in store, and if anything had arisen at the works the town would have been left in darkness. During the last ten years the consumption has been increased 50 per cent. per annum. Many people now take gas who did not previously do so, and it is also extensively used for cooking purposes. Our works are kept up in the best order, with the very latest improvements. From 1861 to 1880 we have written of various sums for wear and tear of works, amounting in the whole to £15,000.

Cross-examined by Mr. MICHAEL. We think a differential rate of 1s. per 1000 feet will cover any additional expense we may incur in extending our mains.

By the COMMITTEES: In 1878-79 we expended the sum of £10,241 in building a new retort-house and other things, including land.

Mr. John Wolf, examined by Mr. CHARLES LEIGH.

I am an Engineer, and have been in the office of the Manchester Gas-Works for eleven years, but am now Chief Superintendent and Gas Engineer to the Corporation of Manchester. When I first went to Maidstone the retort-house contained 120 retorts, which were worked on the old system; they were 15-inch circular retorts. The production of gas per day of the 24 hours was about 650 cubic feet per monthpiece. The coal stoves and the machinery adjoining the retort-houses were in a cramped position, and were very badly arranged.

The CHAIRMAN: I suppose there is no question that the works have been very much improved?

Mr. DUGDALE: We say that the works are in a most efficient condition, and that they can do more than they are doing now.

Examination resumed: I erected a retort-house capable of holding 14 benches of retorts, and containing 172 mouthpieces. The maximum quantity of gas last winter was 800,000 cubic feet, and we have two gasholder holders together capable of containing 800,000 cubic feet of gas. It will hold about 8000 tons of coal. The condensers, exhausters, washers, and scrubbers are capable of passing a million cubic feet of gas per day; in fact, everything is adequate except the gasholders and purifiers. We did not expect the purifiers would last for some time to come; but supposing they were to last for 100 years, we should be able to supply the town with adequate to meet the requirements. In the year ending June 30, 1879, we made 118,726,000 cubic feet of gas. An enlargement of gasholder capacity is very much required, because it is a matter of great difficulty to supply the town with gas last winter, when fog comes on very suddenly. We already require an increase of 50 per cent. in the production of gas. In view of the future I should recommend an increase of 100 per cent. The increase in consumption between 1868 and 1879 has been about 8 per cent.; in the former year it was 66,474,000 cubic feet, and in the latter year 118,726,000 cubic feet. The proposed new gasholder would cost £10,000 to £12,000, and would hold 600,000 cubic feet of gas. Its diameter would be 130 feet, but it is not yet decided whether it is to be a single or double lift holder. The cost of the land is not included in the sum I have mentioned. I have made out a tabulated statement of the additional items of expenditure which, in my judgment, will be required for the works, amounting in the whole to £48,965, including the overdrawing account at the bank of £4565, and the expenses of the Act we are now applying for, which are put down at £3000. We supply a very large number of stoves in Maidstone, both for cooking and heating. I consider the extension of the radius to four miles would be most reasonable, because the outlying districts are very small. With regard to the share

capital, up to June 30, 1876, there had been raised the sum of £41,200, and we had received for premiums on the sale of shares, £1816 18s.; making together, £43,016 18s. Since that date £9000 had been raised by shares and £10,000 by loan, making a total on June 30, 1878, of £53,016 18s. Up to the same date the total expenditure had been £56,209 6s. 6d., showing the capital account to have been overdrawn to the extent of £3922 2s. 6d. The amount standing to the credit of the reserve-fund on the 30th of June, 1879, was £2227 12s. 4d., of which sum £120 1s. 4d. has been invested in Consols. By our Act of 1858, we are entitled to a reserve-fund of £3000, so that £2772 7s. 8d. is still required to complete that fund. From June, 1876, to June, 1876, the price charged to private consumers was 3s. 6d. per 1000 feet, and for the public lights 4s. 10s. 3d. per lamp, including repairs, lighting, &c. From June, 1876, to June, 1879, the price was 3s. 6d. per 1000 to private consumers, and 4s. 6s. 6d. for the public lights, the average time of lighting being ten hours per night per annum. The increase in the gas made during the ten years, 1869-79, was 72.10 per cent., or an average of 7.21 per cent. The increase in the gas sold for the three years ending June, 1879, was 26.15 per cent. The leakage in 1876 was 11.89 per cent, and in 1879, 10.92 per cent. The net profit for the year ending June 30, 1876, was £2390 18s. 10d., which works out to 11.35d. per 1000 cubic feet; during the year 1877 it was £3610 9s. 4d.; 1878, £3907 10s. 6d.; and 1879, £3187 15s. 11d., or 7.31d. per 1000 feet. Our maximum dividends on share capital in 1876 were £2910; 1877, £5047 10s.; 1878, £3533 6s. 4d.; and 1879, £3187 15s. 11d. The net result of the dividends for 1876, which we had not sufficient within 1.40d. per 1000 feet. On June 30, 1879, there was a net balance in favour of the Corporation of £11,319 11s. 4d., out of which the dividend for the year had to be taken, amounting to £3622, reducing it to £7597 18s. 4d. A certain amount was then required to make up the deficiency of the year-end balance, and the balance of 1879, which reduces the amount to £4923 10s. 8d. Then there is the question of the suspense account, £2000, which leaves a net balance to be carried forward of £2922 10s. 8d.

Mr. LEIGH: What working capital, if any, is there in addition to this? Mr. LEIGH: There is not any working capital. We have overdrawn our bankers account.

There is an item with reference to paying off the suspense-account—will you explain that?—I have already said that the works are very old, and incapable of meeting the requirements of the town. According to our Act of Parliament there is no allowance made for depreciation, and in this case the works did not have anything done to them for several years; but at length there came a time when the whole of them required renewing, and so we commenced, as soon as we purchased the land, to remove, as it were, from one end of the ground to the other, and the works were then diminishing, and in this way, in this case, a gasholder was pulled down to make room in the yard for storing our coke. This really should have been paid for out of the revenue for the year, but we could not do so; we therefore paid as much as possible in that year, and the remainder we call a suspense account, to be paid in future years out of revenue, because all such things ought to come out of the profits of the working of the works. There was a sum of £900 charged in the repair and maintenance account during the year ending June 30, 1878, and another amount of £2400 charged to the same account for 1879, making a total of £3300 in those two years, of which there still remains £2000 to be taken out of profits. If we could not get our way to start clear, and, therefore, this £2000 would be charged to revenue account, and taken out of the net available balance. I have prepared a tabulated statement with reference to the repair and maintenance, which is follows:—

As to Repair and Maintenance Accounts.

During the year ending June 30, 1876, there was expended on—	Pence per 1000 sold.
Repair and maintenance of works	£3305 3 8 or 9.57
Repair and maintenance of mains and services	1052 4 3 " 3.05
Repairing, renewing, and refitting meters	163 6 7 " 1.75
	14.37

During the year ending June 30, 1877, there was expended on—	Pence per 1000 sold.
Repair and maintenance of works	£4445 4 11 or 11.93
Repair and maintenance of mains and services	371 10 0 " 1.92
Repairing, renewing, and refitting meters	410 14 10 " 1.10
	14.55

During the year ending June 30, 1878, there was expended on—	Pence per 1000 sold.
Repair and maintenance of works	£4829 15 1 or 12.28
Repair and maintenance of mains and services	494 19 7 " 1.26
Repairing, renewing, and refitting meters	473 11 7 " 1.30
	14.74

During the year ending June 30, 1879, there was expended on—	Pence per 1000 sold.
Repair and maintenance of works	£5830 5 11 or 13.36
Repair and maintenance of mains and services	291 10 0 " 0.68
Repairing, renewing, and refitting meters	509 8 10 " 1.24
	15.28

In making out this statement, I have taken into consideration that the old works have been almost entirely demolished, which makes the account appear very heavy. In 1876 our old purifiers were pulled down, and in 1877 an old gasholder and iron tank were removed. The value of the materials sold was credited to a fixed plant account, and the balance credited to the repair and maintenance account. We have no provision for depreciation, and this necessarily makes the repair and maintenance account heavier. There was nothing done for many years, and the consumers reap the advantage by getting cheaper gas. During the eleven years I was Manager, the Company must decidedly fulfilled all the obligations they were placed under by the Act of 1858. We are entitled by that Act to charge up to a 6s. maximum; but for the last ten years we have not charged more than 4s. 6d., while at present the price is 3s. 3d.

Mr. LEIGH said he had placed in his hands a report by Mr. Adams, the Manager of the Corporation Gas Engineer, on the gas supplied by the Company during the years 1876 and 1877, giving the details of the illuminating power, the amount of sulphuretted hydrogen, and as to the presence of ammonia and sulphur.

The CHAIRMAN: This is with reference to the past supply of the Company, is it not?

Mr. LEIGH: It is a little more than that.

The CHAIRMAN: No allegation is made in the petition as to your conduct in the past; therefore how is it material?

Mr. LEIGH: The Corporation say: "We want to put a restriction and obligation on you, that is to say, 20 grains of sulphur; and, in addition, we make the allegation against you that in your gas there is sulphuretted hydrogen."

The CHAIRMAN said he thought the promoters were entitled to say that in the petition there was no allegation with reference to their conduct in the past.

grains: March 24, 34.49 grains; April 7, 19.75 grains; April 20, 19.21 grains; May 1, 17.25 grains; May 19, 11.75 grains; June 10, 10 grains.

By Mr. LEIGH: I attribute these variations to the fact that our purifiers are not large enough to remove the whole of the sulphur compounds systematically. It is, therefore, hard upon us to insist upon the limitation to 20 grains. The Company are not represented when the Corporation tests are taken.

Mr. LEIGH: If the sulphur has to be eliminated, will there be an increase in expenditure so far as purification is concerned?

Witness: Yes.

Mr. DUGDALE: And, in addition, would there be an extra cost for an increase of illuminating power beyond the 14 candles?—Certainly there would; and we have not reckoned those items in our calculation.

By the COMMITTEE: One penny for the sulphur is the lowest price I think you can put, and 4d. for the two candles illuminating power. Some of our friends think it can be done for 1½d. per candle, but my estimate is for the estimated cost of the consumption of gas in the extended district is from 6 to 9 million feet, but we do not know the exact quantity in one or two cases.

Mr. LEIGH called the attention of the Committee to the fact that the power of the Company to raise additional capital was contained in the 14th clause of the Bill, and that there was a proviso in the amended Bill that the Company should not create or issue, within the year following the passing of the Act, any greater nominal amount of capital than should be sufficient to produce, in the manner therein stated, £50,000. The calculation of expenditure made by Mr. West was upon this basis.

THURSDAY, JUNE 17.

Mr. West was recalled, and handed in a statement showing the estimated cost of the mains required in connection with the outlying districts, amounting in the whole to £6019 10s.

Examined by Mr. COOPER (in the absence of Counsel): The table also shows the amount that will be required to be expended within the present radius, in order to reach the limits of that radius. For instance, taking the extension to West Malling, £135 would be expended in the old district, and £1072 10s. in the new; and it would be the same in the other cases. I have prepared a table showing the estimated quantity of gas required for the outlying districts, which is as follows:—

Maldstone Gas.

Estimated quantity of gas required for outlying district:—

Hollingbourne	1,026,500
New Mills	1,000,000
Wateringbury	2,250,000
West Malling	2,900,000
Barham Court	250,000
Bearestead and large houses in line of main	1,500,000

8,026,500 cub. ft.

Is, extra per 1000 = for 8,026,500 cubic feet, £401 6s. 6d.

Say £6000 expended on mains to produce above results.

This should be calculated at 5 per cent. premium on the capital required on account of this will form part of the outlay of £6000.

£6000 at 5 per cent.	£300 0 0
Allow for extra supervision, &c.	100 0 0

£400 0 0

The calculation that the £6000 will be raised practically at 5 per cent. interest is owing to the operation of the auction clauses. The premium fund of £500 will be expended on the additional 8 million feet, making £400 in all.

Mr. COOPER: The £400 does not represent the only return you will get on that expenditure, but it is *plus* the profit you will obtain on the gas you will sell within the 8 million feet?

Witness: Yes.

By the COMMITTEE: We propose to supply the outlying districts with gas in bulk, because they will still have their distributory works.

By the KAYNOR: From 1870 to 1873 the price was 6s. 6d. per 1000 feet, and the public lamps were charged at 4s. 6s. per annum. In 1873 the price was 4s. 3d. per 1000, and 4s. 1s. 6d. per lamp; 1874, 4s. 6d. per 1000, and 4s. 6s. 8d. per lamp; 1875, 4s. per 1000, and 4s. 17s. 8d. per lamp.

[Witness was cross-examined by Mr. Dugdale at some length with reference to the details of the tables he had prepared, in the course of which he said that the Company had taken into consideration the large houses in the district, and also the probable requirements, as it would not be right to lay down too small a main, and then find it was inadequate to meet the wants of the district.]

Mr. Robert Paulson Spice, examined by Mr. LITTLETON.

I have known the Maldstone Gas-Works for several years past, and may say that they will be completely remodelled when the proposed extensions are completed. When I first knew the Company they were in a state of great difficulty with regard to the space they had to work in. The alterations and improvements which have been made are quite up to the present state of the knowledge of gas manufacture and the science of gas making. The Company's capital is small in proportion to the business done. They have always conducted their business on economical principles, not charging everything to capital, but paying something out of profits, as they thought they ought to. In my judgment the consumers of gas have really paid for some of the new works when the price might have been reduced.

A MEMBER OF THE COMMITTEE: In fact, the Company have been charging too much for their gas.

Witness: Yes, it comes to that. If they had found the capital for their extensions, instead of paying for them out of revenue, the price of gas might have been reduced a little lower; but virtually it cuts the other way, because the consumers of to-day are reaping the benefit of this extreme care and economy. I do not know of a gas company where the directors have more scrupulously and strictly carried out their duties, and I know a great many companies where the directors are not so.

Examination resumed: The present site of the works will be adequate when the Company have secured the extra land; otherwise it would not be adequate for future requirements, nor indeed for the present, because there is no room for additional gas storage. The total capital required for apparatus and buildings within the next twelve months will be £48,900, as stated by Mr. West, whose figures I adopted. I think a standard price of 4s. per 1000 feet for Maldstone would be a perfectly reasonable one. It ought really to be 4s. 3d., but I knock off the 3d., depending on an extension of business. I think an extra price of 1s. per 1000 for the outlying districts would be both fair and profitable, and I advised the Company to that effect.

By the COMMITTEE: The Company required 8s. 4d. to pay their maximum dividend last year, although they only charged 8s. 3d. There was no reserve, but even so, it was advantageous to them at that time. They were working up to the full, so the capital was only used in proportion to the business done; but such a state of things is at an end when it is seen that they must spend in round numbers £45,000. They would certainly have to pay a dividend of 5 per cent. on that amount at

the end of the first year, and this alters the case altogether. It must be taken into account that the year before they were working under very extraordinarily favourable circumstances—coals were cheap, and everything was to the advantage of the Company, but this will no longer continue. There is a necessity for providing for the wants of the undertaking to the extent of £48,000 in one year, and this will require an addition of £1600. So to secure the safety and ensure the possibility of supplying gas at 4d. per 1000 feet vanishes entirely, according to my view, and I do not think it can be disputed.

Examination continued by Mr. LEIGH: I do not think the Company should be tied to a maximum of 20 grains of sulphur. My contention between the parties, with a view to effecting a settlement of this vexed question, was a latitude of 5 grains in 100 cubic feet of gas, and I think that is perfectly reasonable. I believe that chemists who support the case in this respect will say that 20 grains ought to be the standard. In London it is as much as 25 grains in the winter, and it cannot be expected that in a provincial case there should be any latitude at all. It is not within the exact limits. The difficulty is not the capacity of the purifiers, but the want of knowledge, which I may say no living man possesses, of the true and exact nature of the material which affects the arresting of the sulphur compounds. It is lime in the first instance. Before it will arrest these compounds, it must be saturated to a certain extent with the solid products, and when it has arrived at a certain stage of foulness, it lays hold of the sulphur compounds, and keeps them. But it is not long in that state. The operation of passing foul gas through it goes on, and it becomes supersaturated, so to speak. I have looked at the returns made by the chemists of the Corporation, and I have seen this statement; and I see there abundant evidence of the truth of what I now advance—that the thing is almost beyond control. I would not say it is beyond control if it were in the hands of a thoroughly well-educated chemist, who was at hand to see how the thing was going on, because it would be simply a question of purifying power. It is almost always the purifiers in a certain stage, his attention would be confined to it, and his knowledge would be equal to it; but no country gas manager ought to be placed in such a situation as to have his company liable to a heavy fine being imposed if 20 grains are exceeded. In the next place, I think it is not so much as to stick up for over 30 grains, because I believe there is no injury to health likely to arise from breathing that amount of sulphur. There is no perceptible difference in breathing the air of a room which is illuminated by gas containing, say, 30 grains of sulphur compounds per 100 feet. It might just as well be 30 grains as 20 grains, so as any practical results are concerned, and I have seen this statement scrupulously accurate. There is no difference between the winter and summer months. One day the sulphur test will show 11.13 grains, and the next day 35 grains, but no one knows why. I believe it would cost something like 1d. per 1000 feet additional if the sulphur compounds are limited to 20 grains. With regard to illuminating power, my opinion is that to supply 15 candles per 1000 feet must make 16, I put the extra charge at 1½d. per 1000 feet. If I am driven to 16-candle gas, the additional cost would be 2d. per candle.

The CHAIRMAN here inquired whether there was any probability of the offer made on the previous day being accepted by the opponents of the Bill.

Mr. POPE said his clients had done all they could, but his learned friend's clients evidently did not know what they wanted.

Mr. DUGDALE said if there had been a reasonable offer made it would have been accepted by the Corporation.

Cross-examination by Mr. COOPER: The Corporation have not considered their own interests at all, but those of the gas consumers, in seeking to keep the capital down.

Mr. DUGDALE: Is it to the interest of a gas company, when they have a limited dividend without the sliding scale, to keep their works up to the highest possible state of efficiency out of revenue, instead of reducing the price of gas to the consumers?

Witness: That is a fallacy.

Is it not also to the interest of gas companies, when they have a sliding scale, to pass on to capital everything that they can, consistently with being able to meet their fixed interest dividend?—I think so. I have with you on either footing. I think self-interest would dictate to a gas company to continually bring in capital upon which they could obtain 10 per cent. You may take it that the auction clauses have been devised in the interest of the consumers.

Cross-examination by Mr. COOPER proposed to be raised by the present Bill. In point of fact, if this sum can be raised under the auction clauses to pay 5 per cent., as you assume it can, there will be an additional premium payable of £32,000 on the £80,000?—That is not correct, because we are not allowed to do so by law. The £80,000 to be raised includes the premiums.

Mr. DUGDALE: If that is so, I made a mistake.

Mr. POPE said that was not a mistake; it was merely the converse of the proposition. Instead of £80,000 *plus* the premiums, it was £80,000 in the whole, including the premiums.

Cross-examination resumed: Storage for the gas must be provided and in a few years another retort-house will be required, for which there is no room on the present site. My rule is to provide for the daily supply, and the storage should be equal to it. In some exceptional cases even more than that would be required—say, in manufacturing districts, where the bulk of the gas is sold in bulk, and where the gas is used for power accommodation at present for 40,000 cubic feet of gas, while the average daily sale is 300,000 feet, or thereabouts. The proposed holder will be of a capacity of 500,000 cubic feet, but when building a gasholder it must not be constructed equal only to the daily make, otherwise another one would be required in the following year, because the increase cannot be provided for. I should provide for an increase of 10 per cent., because there would be something like 6 per cent. added at once for the additional districts, and 4 per cent. inside the town. In view of those increases, I am of opinion that the Company have not asked for enough capital; it would have been wiser to have asked for £100,000, and that would not carry them on long.

Mr. DUGDALE: Supposing the Committee did not think fit to sanction the supply to the outside districts, then you would have 4 per cent. increase inside, and that would double the present production in about 30 years, would it not?

Witness: It would go on faster than that. There is no reason why Maldstone should not follow what is now the normal rate of increase of 8 per cent. I must decline to be tied to 4 per cent., or any other rate.

I do not understand that there is anything in the special trade or population of Maldstone which would make the increase any rapid than it has hitherto been?—I believe the population has little or nothing to do with it. I have known places where the population has been stationary, and yet the consumption of gas has gone on increasing.

By the COMMITTEE: I think that an increase of 1000 feet for the outlying districts will not increase the consumption of the Maldstone Company's gas, because the inhabitants there are now paying 7s., 8s., or 9s. per 1000 feet.

Mr. DUGDALE: I wish for a little further development of your standard

of 4s. We will say that at the end of 1879, with a price of 3s. 3d., the Company were earning their maximum dividends?—No; they were paying them, but they did not earn them. They were spending money and getting into debt, because they owed their bankers £4500.

How much, in your opinion, is usually reckoned per 1000 feet as sufficient for repairs and maintenance of works?—That is a very variable thing. I have a case before me where it costs 2s., but if the works were new it would not require anything like that amount. At the largest works in the world—those at Beckton—it is 0-6d., against 13-6d. at Maidstone.

By the COMMITTEE: My opinion is that about 10d. or 11d. would be the average.

Mr. DUGDALE: If you look at the table which was handed in yesterday you will find the figures for the last four years—during which time the Company have been renewing the whole of their plant—14-37d., 14-55d., 14-74d., and 16-28d?

Witness: I find these are 9-57d., 11-22d., 12-28d., and 13-26d. I have therefore taken the most unfavourable year for myself.

So you see, on your own estimate, there ought to be saving on the 1876 expenditure of about 3d. per 1000 feet?—About that.

Then for the year 1879, taking things to remain as they are, with the exception of the summer time, for repairs and maintenance, the price would stand being reduced from 3d. to 3s., and still give the maximum dividend?—No; there is 1d. short to begin with. If we are going to take advantage of the 4d., and call it 3d., I do not understand it, because every penny is an object.

Why is it necessary, in order to bring your illuminating power up to 16 candles from your present 14, to ask 4s. or 4s. 3d. as a start for your 3s. 3d.? Will you tell us what you want to add to that?—I start with the cost, charges, working expenses, and general expenses connected with the business, and the materials, 3s. 25d. Then there is the cost of the extra two candles, which is 81d., and 1d. per 1000 feet for the removal of the sulphur. Adding that 1d. to 3s. 3d. brings it to 3s. 74d. There is also the additional capital of £45,000 to be expended, and I add 5-16d. for that.

I thought you said you were going to increase 10 per cent.?—Then it will take ten years before the whole is utilized.

You mean to say you wish the Maidstone Company to expend capital in order to have a reasonable probability of having a sufficient remunerative return?—No one wishes capital to be spent unremuneratively, but the capital must be expended before the business can be added to. We cannot set up a little bit of a return-house; we must build the house.

Do you think it will be fair to saddle the consumers of Maidstone with an initial price calculated for ever, when the Company are to be occupied at any rate within ten years?—I do not provide for ever; but I am obliged, as a practical man, to point out that it will be much fairer for the Company to meet the growing requirements of the place, and spend this £45,000, than to say, "We will go no farther; we have a profitable business, and do not wish to extend it."

With regard to purification, I was glad to hear you tell the Committee it was the want of the exact knowledge of a scientific chemist which made the difference in a provincial town. What money compensation would you think of making?—That I am not prepared to answer, because I do not know how chemists are paid.

You will agree with me that the principal thing to be looked at is not to force the gas too quickly through the lime?—That is why we want large purifiers, so that the current may be slow.

So that it is not impossible for a merely scientific chemist?—If all the surroundings are adjusted to the requirements, the course of the difficulty vanishes.

You have been telling us about The Gaslight and Coke Company at Beckton. Is not the expense of purifying three 1d. per 1000 feet?—About that for materials and labour; but there is something more involved, because we have to get rid of the lime, when it is saturated with the sulphur compounds. It has to be carted or barged away, and the nuisance arises as soon as you disturb it, because it flies all over the neighbourhood.

CHAIRMAN: You would have to get the lime removed, whether the quantity of sulphur allowed in the gas was 20 or 25 grains per 100 feet.

Witness: When it is forced upon us; but there are many places where there is nothing of the sort.

By the CHAIRMAN: I am now speaking of what the Bill provides for.

Mr. PORZ said the Bill did not mention sulphur. If the Committee thought it right to impose this condition on the Company it would be something in addition to what was provided in the Bill.

The CHAIRMAN said it was referred to in the petition, and he supposed all parties accepted the difficulty of getting rid of the nuisance would be the same whether the quantity was 20 or 25 grains.

Witness said that if large purifiers were erected, and a margin of 5 grains allowed, the difficulty would be obviated. Gas could be purified at ordinary works without the highly scientific process of lime first and oxide of iron after, by the simple process of passing it through oxide of iron, and then through carbonate of lime, and so taking out the carbonic acid. Then the nuisance would vanish altogether.

By Mr. DUGDALE: Clauses with regard to impurity are inserted in all Acts, but it is not common in provincial Acts to have a strict test with regard to impurity. The sulphuretted hydrogen and ammonia are prohibited under the General Act.

Mr. PORZ said he was authorized by the Gas Company to assent to a provision of 20 grains of sulphur, if the Corporation would agree to accept the London principle of taking an average of three days, so that there must not be an accidental excess to subject them to a penalty.

Mr. DUGDALE said he could not agree to that.

(To be continued.)

Legal Intelligence.

HIGH COURT OF JUSTICE, IRELAND.
COMMON PLEAS DIVISION.—SATURDAY, JULY 26.
(Before Justice O'BRIEN and a Common Jury.)

NEWRY GAS CONSUMERS COMPANY v. THE TOWN COMMISSIONERS OF NEWRY.

This case, which had occupied the Court the two previous days, was now concluded. It was an action brought for the recovery of £147 9s. 10d., the ascertained value of certain materials which it was alleged the defendants undertook to purchase when taking over the Gas Company's undertaking. By an agreement made in pursuance of the provisions of the Newry Commissioners Gas Act of 1878, the Gas Company conveyed their undertaking to the Town Commissioners in consideration of £28,500 paid to them by the defendants, in addition to which it was provided by the 7th section of the Act, that they should pay "for all coal, and other material necessary for the purposes of the undertaking, remaining in stock at the date of transfer, at such price as shall, failing agreement, be determined by arbitration." The defendants purchased the coal; but, as the plaintiffs alleged, refused to take over the other materials in stock, the

value of which was ascertained to be £147 9s. 10d. The defendants denied that the articles were materials within the 9th section, alleging that they were included in the purchase price; and made a counter-claim in respect of an alleged breach of the duties imposed on the plaintiffs by the Act, to keep up the usual supply of gas pending the transfer, and to maintain the works in a condition of efficiency. In their counter-claim they specially alleged that when the gas undertaking was transferred to them, the supply of coal had been suffered to run short, and they were obliged to purchase a large quantity of inferior coals in Newry at a loss, in order to keep up the supply of gas to the consumers. The Company, however, traversed this counter-claim; and brought forward evidence to show that the short supply of coal was no fault of theirs.

Justice O'BRIEN, in suggesting that a *stet processus* be entered (the plaintiffs undertaking to pay the costs of the defendants), remarked that there was no doubt an insufficient supply of coal was maintained by the plaintiffs, but he acquitted them of any sinister or underhand design in reference to the matter.

Judgment was entered accordingly.

EDMONTON PETTY SESSIONS.—MONDAY, JULY 5.

(Before Messrs. JAMES ABBIES, Chairman; H. NASH, J. HOWARD, and J. BOLTON DOL.)

THE EXTRAORDINARY CHARGES AGAINST THE DIRECTORS OF A GAS COMPANY.

Mr. John Malcolm, one of the Directors of the Tottenham and Edmonton Gaslight and Coke Company, was charged on two summonses obtained at the instance of Mr. W. Bellingham—first, that he did between April 10, 1878, and on divers days between that day and April 10, 1880, then being the date of the Tottenham and Edmonton Gaslight and Coke Company's default, and concur in omitting certain material particulars in a book or books of accounts (to wit), the gas consumers ledger or ledgers belonging to the said Company; and, secondly, that he had taken about 100,000 cubic feet of gas or thereabouts, the property of the Company. The circumstances in this case were somewhat similar to those in the charge against Mr. J. Brickwell, reported in our issue of the 29th ult.

Mr. BESLEY, as before, appeared for the prosecution; and Mr. WEBSTER, Q.C., for the defendant.

Mr. BESLEY, in opening the case, said in the former charge he had pointed out the second section of the Act of Parliament which applied to the case; but, in consequence of the able address of his friend Mr. Webster, he thought it desirable to call attention to the meaning of the word "fraud" as stated in "Chamber's Dictionary." "Fraud" was there defined as "an artifice by which another is injured," and this definition had obtained in all the Courts since the date of the Act. The second section of the Act stated that whosoever, being a director, public officer, or manager of any public body, should receive any of the public property otherwise than in payment of a just debt or demand, or omit to make or cause to be made a proper entry in the books of the body corporate, should be held to be guilty of a misdemeanour. The defendant submitted that nothing in the said section should affect or prejudice any agreement entered into or security given by any trustee having for its object the restoration or repayment of any trust property misappropriated. Whether this was applicable to a director of a public company or not was not for him to discuss; but he thought as reference was made to the last preceding section, it was intended to cover every form of breach of trust which was done fraudulently. Now it was necessary to make out that the defendant was a Director or member of the Company, and the inquiries which had been made disclosed these facts: That early in the history of the Company, a Miss Henry was possessed in her own right of 100 original shares, and that after her marriage with Mr. Malcolm, the shares remained upon the register in respect of these shares. Mr. Malcolm was a Director of the Company in 1855, but not being a resident within the district at that time, he did not have a supply of gas from the Company until the 4th of October, 1876. The question of the shares being sold by the Miss Henry to Mr. Malcolm was put in issue in December, 1869, he transferred 100 shares to his wife, and in December, 1873, he transferred 10 shares to another lady; and in February, 1874, he executed a transfer of 100 shares to Alderman Finnis. So that by February, 1874, he had denuded himself of 210 shares, leaving only 8 shares in his name. This number did not qualify him as a Director, though he still continued to act as such until the 14th of August, 1874, on the 14th of April, 1874, he, carrying on business with Mr. Henry and Mr. Stewart, under the style of T. and D. Henry and Co., filed a petition in liquidation.

Mr. WEBSTER said it was monstrous to go into these matters. They had nothing to do with the fact of Mr. Malcolm filing a petition in liquidation, but were simply dealing with the allegation that he, being a Director of the Tottenham Gas Company, consumed gas fraudulently.

Mr. BESLEY thought it most material to see in what capacity Mr. Malcolm was at the time of joining the Company.

The CHAIRMAN: I think you are justified in stating what you have, but there is no necessity to go into the question which you are now opening.

Mr. BESLEY said he could show that Mr. Malcolm, under his own hand, swore that he only held 8 shares in April, 1874.

Mr. WEBSTER said there was no charge of perjury in question. There were 100 shares standing in Mr. Malcolm's name; and, consequently, he was qualified to act as a Director of the Company.

Mr. BESLEY said there were elements of immense importance surrounding the case; and it was a matter of public importance to know that there was a declaration upon oath by Mr. Malcolm that he only held 8 shares in the Company. On the 22nd of August, 1874, he received a transfer through a Mr. Brackenbridge of 100 shares from his wife, and this was his qualification for a directorship. On the 26th of August, 1874, Alderman Finnis issued the conveyance which had been made to him in the previous February, and, therefore, it became necessary for the defendant to have a transfer from his wife, which he obtained on the 2nd of August, 1874. In 1875 he came to live within the district supplied by the Company, and having made a usual application, a meter was fixed, and from that date he had consumed 312,000 feet of gas, of the value of £66 16s. 7d. The state of the index of his meter had been recorded by the defendant every quarter, but by his express directions the account had not been entered in the consumers ledger.

Mr. WEBSTER: By whose direction?

Mr. BESLEY: By Mr. Malcolm's express direction. After the discovery at the meeting of the Company on the 10th of April last, the defendant paid by cheque for the amount of gas consumed; but this payment did not invalidate the charge that he had fraudulently offended against an Act of Parliament. He (Mr. Besley) would remind the Bench that the conversation between the Directors, the date of which had been fixed by Mr. Randall, as to not preferring a charge against the Chairman or the Director of the Company, took place on the 22nd of August, 1874, when present, but that gentleman was not in a position to take gas until 14 years afterwards. After proving the facts which he had shortly opened, he should ask the Bench to commit the defendant for trial.

Mr. Henry Alfred Stacey, examined by Mr. BESLEY, said: I produce the file of proceedings in bankruptcy in the matter of David Henry, John

Malcolm, and George Stewart, trading as T. and D. Henry and Co. The petition was presented by the defendants.

Mr. WEBSTER objected to the proceedings in bankruptcy being used in the present case. If necessary, he was willing to give any explanation upon the subject; but they had not met to inquire what the defendant had done on a previous occasion. They were present upon a summons charging the defendant with having fraudulently converted gas to his own use. Mr. Besley was trying to show that some five or six years ago the defendant dealt with his shares, and made some statement in bankruptcy, but there being no charge of this nature before the Bench, it could not be gone into.

Mr. BESLEY said it was important to know whether the defendant was a mere officer, Director, or was acting as a member, or a mere Shareholder in the Company. He only proposed to show that in the Liquidation proceedings Mr. Malcolm stated he only held 8 shares.

The CHAIRMAN: What bearing would that have upon the charge now made against him?

Mr. BESLEY: The way he put it was this: That the evidence must go before the jury, to show the fraudulent intent.

Mr. HOWARD said the words of the Act were "director or member," therefore it did not much matter whether he was a Director or not.

Mr. BESLEY said if the evidence was excluded, the Court were prevented from seeing how improperly they took as a Director.

Mr. WEBSTER said the gas was not taken until 1875, and, according to his friend's opening, Mr. Malcolm purchased from Mr. Brackenbridge, in 1874, 100 shares.

The CHAIRMAN having allowed the objection, the witness, upon the request of Mr. Besley, was brought over.

Mr. James Randall, examined by Mr. BESLEY, said: I am the Secretary of the Tottenham and Edmonton Gaslight and Coke Company. Mr. John Malcolm was appointed a Director of the Company on the 1st of September, 1865, and he has acted as a Director from that date till the present. He lives in the district supplied by the Company about October, 1875, and occupied Elgin Villa, Landsdown Road, Coleraine Park. Upon the request of Mr. Malcolm, dated Oct. 1, 1875, a meter was fixed at the house, and the state of the meter was taken every quarter by the inspector, Mr. Cairns, or his assistant. The inspectors were supplied with a Bench-book, which was put in the meter, the fore and counterfoils, the state of the index of the meters was entered upon both, and one part was left with the consumers. I produce the meter-book, having the counterfoil in it on which Mr. Malcolm's name appears, for the Christmas quarter of 1875. He is there charged with £9 13s. 10d. for gas and coal money.

Mr. BESLEY: Had you any conversation with Mr. Malcolm, and, if so, when, about the supply of gas?

Witness: About the 18th of December, 1875, he said, "I will be taking the register of the meters shortly, will you not?" I said, "Yes, Sir." He said, "I am not clear about the gas I have consumed," and that as Mr. Brickwell had a free supply he presumed it was the privilege of resident Directors to have a free supply.

Examination continued: I made no further remark, and the subject dropped. My impression was that there had been a previous conversation between Mr. Besley and the Directors about it. In consequence of the conversation I wrote the word "open" on the counterfoil of the Christmas account, 1875, as an instruction to the clerks not to enter it in the consumers ledger. I also told the clerks to omit the account from the ledger. The conversation to which I have referred occurred between myself and Mr. Besley just before the general meeting, while waiting for Mr. Gripper, one of the Directors. I produce the meter-books for the following 17 quarters, and from each the counterfoil has been torn.

Mr. WEBSTER: The books show that the state of the meter was regularly taken every quarter; that is all.

Mr. BESLEY: And the other part was handed to the consumer. (To witness.) Upon each of the counterfoils in these 17 books are the words "not to be entered" written?

Mr. WEBSTER objected to the question on the ground that the defendant was not responsible for what some one else had written.

Mr. BESLEY said that he should not care if a person caused an entry to be omitted he was responsible for so doing.

Mr. WEBSTER submitted that if the entries were going to be used against the defendant, they must be shown to have been made with his knowledge. The MAINTENANCE CLERK: It may be stated that they were so entered, and may be added to the evidence to be so entered.

Mr. BESLEY: Across the counterfoils are the words "not to be entered" written?

Witness: Yes, and initialed by me.

Examination continued: Every fortnight the arrears of consumers are brought before the attention of the Directors, and the outstanding accounts book would also be brought before them upon the first Saturday in the third month after each quarter. There is no resolution of the Directors that Mr. Malcolm was not to be charged. I have searched the minute-book of the Board of Directors to see if there is any record of the subject of the free supply of gas to the Directors, but I cannot find any. Between Nov. 11, 1875, and February, 1879, we have a ledger account against Mr. Malcolm for coals supplied. We sell coal to Directors at the net cost, but we have is. 6d. for ton screening, and 2s. for carting. We get no profit.

Mr. WEBSTER said the whole of the coal had been paid for.

Mr. BESLEY: Was the subject of the supply of gas mentioned between you and Mr. Malcolm on any other occasion besides the one that you have spoken of?

Witness: No, not until he asked for his account after the 10th of April, 1879. The amount was paid on the 24th of April. The amount was £66 16s. 7d. for 312,000 cubic feet of gas.

[A copy of the account was put in and marked.]

The CHAIRMAN: When did Mr. Malcolm ask for his account?

Witness: At the meeting of Directors after the 10th of April. He said he thought the interest of the meeting was that he should pay for his gas, and he asked for his account.

Mr. BESLEY: It appears by the share register that on the 4th of November, 1868, Mr. Malcolm held 218 shares, and on the 2nd of December, 1869, he transferred 100 to Jane Malcolm.

Mr. BESLEY said the Bench had already ruled that this point was not material. The book, if put in, would speak for itself.

Mr. HOWARD said defendant was responsible for his acts as a Director, even if he was not qualified.

Mr. WEBSTER said that was so.

Mr. BESLEY asked that he would be, as a Director *de facto*, though not *de jure*. Continuing, he said: In December, 1873, 10 shares were transferred to Miss Terry, and the 100 shares formerly held by defendant's wife were transferred to him from Mr. Brackenbridge on Aug. 22, 1874, Alderman Finnis having registered the conveyance for 100 shares from the defendant on Aug. 26, 1874.

Mr. HOWARD said he might be quite wrong, but he did not see how the case depended upon all this.

Mr. BESLEY said his contention was that directly a liquidation occurred

every shrod of property passed to the trustee, and there could be no qualification by taking shares from his wife; the shares must be held in his own right.

Mr. WEBSTER protested against statements being made without the shadow of evidence in support, and denied that the defendant had taken shares from his wife in the sense imputed by Mr. Besley.

Mr. BESLEY said it was not on cash, but on credit, which went to the defendant from Mr. Brackenbridge originally belonged to Jane Malcolm. On Feb. 20, 1879, 35 shares were transferred to the defendant.

Cross-examined by Mr. WEBSTER: We supply coke and other residuals to a number of persons. Mr. Malcolm bought coke as well as coal, but he has paid cash for all supplied to him, and he replied to him.

[With a view to shorten the inquiry, it was here arranged between Counsel that the depositions in the other case, as to the interview at Messrs. Munns and Longden's, the letter asking the defendants to retire, &c., should be treated as part of the present case.]

Cross-examination continued: At the conversation in December, 1875, when Mr. Malcolm spoke to me about the Directors having the privilege of a free supply of gas, I think he used the words for "private use." Rightly or wrongly, I acquiesced in what he said.

By the CHAIRMAN: In consequence of this conversation I wrote across the Bench-book, "not to be entered." I assumed it had been a prior conversation between Mr. Malcolm and the Directors. From that date to the present no Director, except Mr. Malcolm, ever mentioned the fact that Mr. Malcolm was to have gas without charge.

Cross-examination continued: After the conversation Mr. Malcolm never interfered directly or indirectly in any way with the manner in which the entries in the books were made. The books never came under his notice. In consequence of my entry the amount due for gas has never appeared in the schedule of arrears. I was present at the meeting on the 10th of April last, and I heard Mr. Bellingham say, "Perhaps Mr. Malcolm will give the same explanation." Mr. Malcolm said: "I have been speaking of the same matter." The meter has been regularly taken every quarter, but no account has been sent in to me; still, if the indication of the meeting is that I should pay for it I am ready to do so. I believe it was placed to my credit on the footing that the Chairman and Deputy-Chairman should not be charged for gas consumed in their private houses, but in any case there is a meter, and I am ready to pay for the gas I have used."

Re-examined by Mr. BESLEY: Mr. Gripper has always paid for the gas consumed in his private house. Mr. Malcolm was appointed Deputy-Chairman in Nov., 1876, and the statements as to a free supply for three years were made. I heard the Chairman and Deputy-Chairman making statements about a free supply, I did not remind Mr. Brickwell that Mr. Malcolm had had a free supply for four years; so many people were speaking at once. When Mr. Malcolm spoke to me about resident Directors having a free supply, I was aware that Mr. Gripper, who was a resident Director, paid for the gas he used, but it did not occur to me to mention it.

Mr. Charles Philip Caine, Chief Inspector of the Company, proved that the state of the meter in defendant's house was taken each quarter, and that a paper showing the quantity consumed was left at the house.

[The witness was asked to read the statement of the Auditors in the previous case should be considered as given in this.]

Mr. BESLEY: That is the case.

Mr. WEBSTER said he sincerely wished it had fallen to the lot of some one else to adduce the Bench in the present case, but, appearing for Mr. Malcolm, it was his duty to make a few observations on his behalf. Although he was aware the Bench had had a similar case very recently before him, he was sure he should be listened to, while submitting that Mr. Malcolm ought not to be committed for trial; and, to a certain extent, he was satisfied that he had fallen from the Bench in the previous case, that they were not free from doubt on the subject. He ventured to point out that if they had any doubt, in the ordinary sense of the word, their duty was to leave the prosecutors to prefer an indictment, and not to commit the defendant for trial upon unsatisfactory evidence. Then they told him that they should put a construction upon the word "fraud" which, he ventured to think, no magistrate, or lawyer, or any body accustomed to deal with such questions, would think of suggesting was the construction to be put upon it. His friend had read from "Chambers's Dictionary," but the definition of the word there given was one that was not the law of England. He said, "I have written down 'an artifice by which another is injured,'" but, in justice to his client, the whole of the definition ought to have been read, when it would have appeared that "an artifice by which another is injured" was not a correct definition of the word "fraud." He would read the whole definition—"Fraud, an artifice by which another is injured; deceit, trick, imposture, stratagem." As a whole, there was not much wrong about it. As to the meaning of the word "fraud" or "fraudulent," Lord Justice Brett, who was no mean authority, had laid it down that there must be a criminal mind, and that a *bona fide* mistake did not constitute fraud. Just consider the evidence upon which these vindictive gentlemen asked that Mr. Malcolm might be sent to trial. Mr. Malcolm applied in the ordinary way for gas; there was not the slightest concealment about it; there was the entry of his application in the book; the meter was put up; and the officials took the state of the index quarterly and reported it to the Board. He said that he was not aware of having moved hand or foot to prevent the fact of the supply of gas to him being known, he knew perfectly well that the officials of the Company were aware of the fact of gas being supplied, and from first to last everything was done in the most open and straightforward manner. Now what happened? He said that he was not aware of the fact of the supply of gas to him for gas. I suppose it is the privilege of Directors resident in the district to have a free supply to their private houses." Now, in order to constitute an offence there must be evidence that when Mr. Malcolm made that statement, it was a fraudulent and untrue statement. If he was telling the truth, the offence could be committed, there being no ill will at the time. According to Mr. Randall's evidence, the conversation took place in 1875, but there had never been the slightest communication, verbal or in writing, from that time to the present by Mr. Malcolm, and the entries had been made by the Secretary, under the impression that he was acting perfectly rightly. Mr. Besley had never interfered directly or indirectly in the matter, and, therefore, he (Mr. Webster) submitted that there was no evidence in support of either charge. His friend said it was a matter of immense public importance that the thing should be cleared up, and he sought to prejudice the mind of the Bench by making suggestions against the defendant, and he stated with reference to shares and bankruptcy proceedings, for the purpose of satisfying the wish of his own clients; although he had the register of Shareholders before him, showing that Mr. Malcolm was qualified to act as a Director, he being the duly registered holder of sufficient shares. At the meeting of the Company on the 10th of April last, Mr. Malcolm stated that he was perfectly willing to pay for the gas if the meeting should so decide. There could thus be no concealment about the matter, and yet Mr. Besley said that payment could not possibly purge the offence. He

surely had forgotten that the summons was not taken out until months after the thing was discovered and the account paid. Unless they could evolve out of their own consciousness some evidence that the man had a guilty mind at the time of the conversation with the Secretary, it was impossible to say there had been a taking or appropriation of the property with intent to defraud. He hoped the Magistrates would not allow the Criminal Law to be used as an engine to extort from gentlemen a confession that they had acted improperly, and that they would say there was not any evidence of a criminal mind or guilty intention.

Upon the conclusion of Mr. Webster's address, the Magistrates retired, and returning into Court after an absence of twenty minutes.

The CHAIRMAN said: The Bench are unanimously of opinion that the case must be remitted to a jury for trial, and in arriving at this decision they have nothing to do with the motives which may be brought forward or asserted on the part of the prosecution.

Mr. Brickwell and Mr. Malcolm were then committed for trial, but released upon their own recognizances.

LAMBETH POLICE COURT.—SATURDAY, JULY 3.

(Before Mr. ELLISON.)

OPponents OF THE CONSTANT SUPPLY SYSTEM.

In the JOURNAL of the 29th ult. it was reported that summonses had been taken out by the Lambeth Water-Works Company against *Motilda Flight and Luther Clements*, two owners of property situated respectively at Hope Street, Tilly Street, and Clary Street, New Kent Road, for neglecting to comply with the regulations under the Company's Acts to provide stand-pipes or covered cisterns with proper fittings, in place of butts, in houses belonging to them. The cases came before the Court on the 30th ult., and were adjourned, as it was stated that Mrs. Clements had commenced the work and already paid an order to pay a fine, together with costs, was made upon the other defendant, an adjournment was allowed to see if the work was carried out.

Mr. BESLEY attended to-day on behalf of the Water Company, and stated that, with regard to Mrs. Flight, she had carried out the requirements of the Company, and the above case against her would be withdrawn, upon the payment of costs. With regard to the defendant Clements, a letter had been received in which it was stated that the property had been sold.

Mr. ELLISON said he should still uphold the order he had made and adjudge the defendant (who did not appear), that he pay a fine of 5s. and 4s. 6s. costs.

Mr. BESLEY asked for a term of imprisonment to be fixed in default.

Mr. ELLISON said it would be 14 days.

Miscellaneous News.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

The Nineteenth Annual General Meeting of this Association was held last Thursday and Friday, in the Academy Hall, North Inch, Perth; and pending the preparation of the full report of the proceedings, we may lay before our readers a brief account of what was done.

The Association steadily advances in numbers, four ordinary and three extra-ordinary members having been elected, viz. Blyth (Kettle), Carmichael (Kierriemuir), Marshall (Breachin), and Wilson (Stonehouse), as ordinary members; and Messrs. Bray (Leeds), Briggs (Aberbroath), and Donald (Johnston), as extra-ordinary members.

The President for the year was Mr. J. Robb, of Haddington, and his opening address, though short, dealt with several points of great interest to gas managers. His remarks were listened to with marked attention; and at their close, on the motion of Mr. D. Bruce Peebles, a vote of thanks was accorded to him.

Mr. Peebles, the Auditor, then read his report on the financial position of the Association, the balance at the bank being given as £42, while there stood to the credit of the Chemical Research and Patents Investigation Fund only £16 15s. 6d.—a sum which we trust will be very largely increased, or little can be done to carry out the object of its institution.

The Scrutinisers (Messrs. Donaldson and Hall, jun.) subsequently reported that the following gentlemen had been elected office-bearers of the Association for the coming year:—

President.—Mr. James M'Gillchrist, Dumbarton.

Vice-Presidents.—Mr. J. Mackenzie, Dunfermline;

Mr. T. Whimster, Perth.

Secretary and Treasurer.—Mr. D. Tennant, Aberdeen.

Committee to replace those retiring.—Mr. G. B. Hishop, Paisley;

Mr. A. Mitchell, Dundee; Mr. S. Stewart, Greenock.

Auditor.—Mr. D. Bruce Peebles.

It was agreed that the place of meeting next year should be in Glasgow.

The first paper read was one by Mr. J. Anderson, jun., of Leven, on "Mechanical Scrubbers"—especially intended to notice Anderson's Brush Scrubber, by Kirkham, Hulett, and Chandler's "Standard" Washer Scrubber. The paper provoked a lively discussion, in the course of which mention was made of a scrubber designed by Mr. W. Young, of the Clippen's Oil-Works, Paisley, more particularly for use in small gas-works. This we shall illustrate when giving the paper Mr. Young afterwards presented to the association.

Dr. Miller, of the Perth Academy, then delivered a lecture on "Heat: Its Mechanical Energy;" after which the adjournment for lunch took place, and a visit was, by invitation of Mr. Whimster, paid to the Perth Gas-Works, to inspect one of Anderson's Brush Scrubbers which had been temporarily erected for exhibition in connection with the paper noticed above. Attention was also given to a small "Bischoff" gas-engine, which had likewise been sent merely to show its action. The members further had an opportunity of seeing a pipe-joint made with Spence's metallic compound, which formed the subject of the first paper read on the re-assembling for the afternoon.

In this paper Mr. Whimster expressed his entire satisfaction with the compound, and stated that he had recently completed the laying of a length of main with it in Perth, from the jointing of which he anticipated the best results. He referred to the paper read by Dr. Cole at a recent meeting of the Society of Arts, and reproduced in the JOURNAL, and laid stress on the fact therein recorded of the success attending some experiments carried out with the metal at the South Metropolitan Gas-Works. He did not, however, allude to the letters subsequently published in our pages, to the effect that any thing but sound joints were obtained with it at the London Gas Company's works, and the Windsor Street Gas-Works of the Birmingham Corporation; nor to the assertion, which was never contradicted, that the identical compound was known and used many years before the date of Spence's patent.

Mr. J. M'Gillchrist's paper on "Retorts and Retort Settings" was a good practical and discursive one, and occupied the attention of the meeting till it was necessary to take up that by Mr. W. Young, entitled "Jottings on the Principles involved in Gas Manufacture," which was well received, as are all Mr. Young's efforts at enlightening his fellow-members.

At five o'clock dinner was served at the Royal George Hotel, the President occupying the chair, supported by Dr. Miller, Mr. Terrace, and Mr. Mackenzie; while the vice-presidents, Mr. Whimster and Mr. M'Gillchrist. After dinner and the usual loyal toast had been disposed of, the Chairman proposed "The Army, Navy, and Volunteer Forces," which was responded to by Mr. D. B. Esplin, of Forfar. The toast of "The North British Association of Gas Managers" was replied to by Mr. M'Gillchrist; that of "The Fair City of Perth" by Mr. D. B. Esplin; and that of "Kindred Associations," by Mr. Donaldson and Mr. Miller; as well as by Mr. D. M. Nelson, of Glasgow, on behalf of the North of England Association. Other toasts followed, interspersed with songs which made the evening pass most pleasantly.

On Friday morning the discussion, adjourned from the previous afternoon on the subject of retort-settings, was resumed and concluded, after which the remainder of the papers were read in the following order:—"Gas Purification by Means of Oxide of Iron," by Mr. D. M. Nelson; "Notes of the Cost of Working a Gas-Engine, Compared with the Same Work done by Steam Power," by Mr. F. T. Linton, of Leith (read by the Secretary); and "A Few Little Things Worth Knowing to Gas Managers," by Mr. Whimster; after which Mr. M'Gillchrist explained a new dial he had had arranged for a photometer meter.

This closed the proceedings; and, after an adjournment for lunch, a considerable number of the members started off for a two hours drive—a welcome relaxation after the business of the meeting.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health on the Composition and Quality of the Metropolitan Waters in June, 1880:—

NAMES OF WATER COMPANIES.	Total Solids Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen, As Nitrates, &c.	Ammonia.	Hardness (Clark's Scale).	
					Before Boiling.	After Boiling.
<i>Thames Water Companies.</i>	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	19.28	0.943	0.143	0.008	14.3	3.3
West Middlesex	19.54	0.913	0.142	0.006	14.0	3.2
Southwark and Vauxhall	19.05	0.913	0.142	0.006	14.0	3.2
Chelsea	18.62	0.935	0.131	0.006	14.3	3.0
Lambeth	19.13	0.924	0.142	0.010	14.3	3.0
<i>Other Companies.</i>						
Kent	31.67	0.904	0.403	0.004	20.3	5.6
New River	20.31	0.912	0.142	0.007	14.3	3.0
East London	20.34	0.951	0.151	0.001	14.8	3.3

Note.—The amount of oxygen required to oxidise the organic matter, nitrates, &c., is determined by a standard solution of permanganate of potash acting for three hours.

The water was found to be clear and nearly colourless in all cases.

C. MEYMOOT TIDY, M.B., &c.

SALE OF SHARES IN THE NEW RIVER COMPANY.

On Wednesday last a large number of speculators and others interested in the proposed water companies shares attended at the Auction Mart, Tokenhouse Yard, E.C., it having been announced that Messrs. Edwin Fox and Bousfield were about to offer for sale by auction one-tenth of a King's Moiety in the New River Company, and five £100 new shares in the same undertaking.

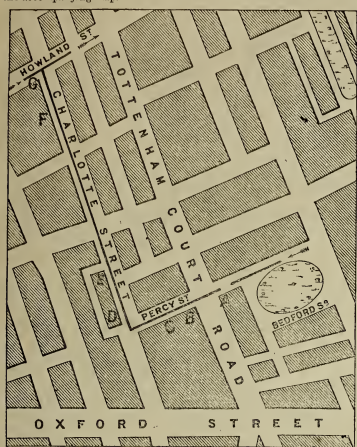
H. BOUSFIELD said that the special character of the New River Company's shares was now so well known that it needed no words from him to recommend them as perfectly safe investments. The increase in the revenue of the Company had, he said, steadily advanced the income, having made £200,000 in the past year, and £206,825 in the year 1862, and £424,097 last year. During the excitement caused by the impression on the public mind that the Metropolitan water undertakings would be acquired by the Government, considerable speculation took place in the Companies shares. Those of the New River Company, however, had never given rise to so much speculation, but the shares remained firm in the position they had assumed, and invariably realised a good price. He then referred to the evidence given by Mr. E. J. Smith before the Select Committee on the London Water Supply, and said he (Mr. Bousfield) was of opinion that the New River Company would probably be taken over by the Government, in which case they would have to pay a high compensation, which would increase the value of the Company's shares; but it would be better still for the Proprietors if the Company were left alone, since the amount of increase in the value of their property in the next few years would be difficult to imagine. The present system of charging for water according to the rateable value of the property to which it was supplied should, he thought, certainly continue, as any alteration that would lead to economizing water in poor districts would be injurious in many ways, and would greatly affect public health. The notion of bringing water 200 miles for the purpose of competing with the existing Companies was, to his mind, impracticable, and with regard to the New River Company, it had the exclusive right of supplying its own district, and therefore no fears of the future need be entertained on this account. Then the New River Company had, in addition to its water business, extensive and important estates throughout London and the counties of Middlesex and Hertford, extending over hundreds of acres, and capable of producing large revenues in the future. Part of this property, said Mr. Bousfield, was the Myddelton Square Estate, and comprising 50 acres of ground, covered with buildings, in the heart of London, was, he said, now let on ground-rents, and in about 27 years the leases would begin to fall in, and the rack-rents would thus become an additional source of income to the Company. Therefore, should the water business of the New River Company ever be taken over by the Crown, the Company would still be left in possession of its valuable freehold estates.

Mr. Bousfield then requested offers for lot 1, the one-hundredth part of a share in the King's Moiety of the estates of the New River, entitling the purchaser to a vote in the election of directors; this property was valued at the proportion of dividend, which was at the rate of £23 16s. per annum at Christmas last. There was a brisk competition, and the two following lots were sold for £910 each. The next three lots, each of a similar character, brought £920 each. The three following lots went for £915 each, and the last lot sold for £925. The total amount realized for the tenth of the moiety was £9160, which would make the entire share worth something like £92,000. The five new shares, which have the same privileges as the old shares (with the exception of the parliamentary franchise), were then disposed of at the following prices:—One at £385, and four at £380 each; the total amount realized being £1905.

KIMBERLEY WATER-WORKS COMPANY, LIMITED.—This Company was registered on the 3rd inst. with a capital of £50,000, in 35,000 shares of £10 each. The object is the construction of water-works in the South African colonies.

ALARMING EXPLOSION OF GAS IN THE METROPOLIS.

On the evening of Monday, the 5th inst., there occurred in the western district of the Metropolis an explosion of gas of an alarming and totally unprecedented character in the history of gas illumination. The catastrophe was attended with considerable destruction of property and much personal injury, which has unhappily resulted in loss of life. The portion of the Metropolis affected was that lying to the west of Tottenham Court Road, an important thoroughfare running from Oxford Street to the Euston Road, and the two streets in which the bulk of the damage to property was caused run respectively at right angles with, and parallel to the above-named thoroughfare. The positions of the streets are roughly shown on the accompanying map.



The whole of the locality which suffered by the explosion lies in what might be called the western central district of The Gaslight and Coke Company, and is supplied with gas by the old small-sized mains of 4 and 6 inches diameter originally laid down. For some time past, however, the service has been regarded as altogether inadequate to the requirements of this important part of the Metropolis, and therefore it was determined to lay a 30-inch main from the 48-inch main in the Goswell Road—the main which conveys the gas from Beckton to London—westward to a point a little to the south of the Euston Road. Here it was to join the main coming from Fulham in a north-easterly direction to King's Cross, where the works taken over by the Chartered Company on their amalgamation with the Imperial Company are situated. This latter main runs along a street called Howland Street, at right angles with Tottenham Court Road, and so on eastward. The work of laying the main was entrusted to Messrs. John Aird and Sons, whose experience in such matters is, perhaps, unequalled; and the supervision of the entire work was left with the Company's Chief Inspector, Mr. T. C. Hersey, about whose qualification for the duty not a single doubt can possibly exist; and he was supported in his labour by all the usual qualified subordinates—men to whom main-laying is, so to speak, an every-day occurrence. The work was commenced in February last in the Goswell Road, and the operations were continued uninterruptedly westward to the end of Bayley Street—a short street leading from Tottenham Court Road eastward into Bedford Square, and marked A on the map—where the open end of the main was, on the morning of the accident, exposed to view in the trench. So far all was ready with respect to what may be called the east-main—namely, the new main running from east to west. In the masonry trench, at a connection with the Fulham main had been made at Howland Street, at the point marked G on the accompanying map, and the work had been continued southwards down Charlotte Street, eastwards along Percy Street, and so across Tottenham Court Road to Bayley Street, where the end of the west-main—the portion of the new main running from west to east—was also to be seen in the trench. The end of this main, however, was plugged, and had upon it a 4-inch stand-pipe. It may here be said that the connections at Goswell Road and at Howland Street had the usual valves, and when left were tested and found to be perfectly sound.

This is how matters stood on the morning of Monday, the 5th inst. As far as was known, all was ready east and west, and there was only a single piece of main to be laid in the trench at Bayley Street to make the entire length of piping from Goswell Street to Howland Street—a distance of about two miles—complete. This connection was to have been made on Tuesday, the 6th inst., and accordingly, on the evening of the previous day workmen were engaged in cutting out the plug from the end of the west pipe. The foreman was standing on the main near the stand-pipe, from which he had removed the pressure-gauge with which he had tested the main, and ascertained that there was no pressure in it. He then smelt the stand-pipe to ascertain whether any gas was issuing therefrom, and finding none came out, he applied a light, and almost immediately a dull rumbling sound was heard, followed by an explosion, which blew one of the workmen a considerable distance into the open pipe on the opposite side of the trench, killing him instantly, and so injuring the other man that he died shortly after his removal to the hospital. The foreman escaped unhurt. There was a quantity of dust and smoke, but no flame was seen. Almost simultaneously with this explosion another occurred at the corner of Percy Street, at the point marked B on the map; others following in rapid succession at the several places indicated by the other letters; the final explosion taking place at the junction with the Fulham main at Howland Street.

It is needless to say that, with such an accident as this, the greatest

excitement and consternation were caused in the neighbourhood, pavestones being hurled into the air, to the great destruction of surrounding property and the peril and injury of passers-by. Fortunately the busy thoroughfare of Tottenham Court Road escaped, or the consequences would have been appalling.

Although the first explosion, which occurred at the point A, was of so lamentable a character, little or no damage was done to the surrounding property. The Manager of the Bedford Head Hotel was standing at the door of his house, more than 20 feet from the spot, when the explosion occurred, and he describes it as a great noise, almost stunning him, and sending him staggering back, though without injuring him. The air appeared filled with what he describes as "a shower of rust," that quite obscured the atmosphere for a moment or two, but he did not see any flame. The first spot at which the roadway was thrown up was at the corner of Percy Street, at the point marked B. Here the main ran along the south side of the street, and the opening in the roadway extends for a length equal to five or six houses. At this point something like a dozen lengths of main must have been upheaved, but there was comparatively little outward damage to the neighbouring houses. Opposite Nos. 6 and 7 in the same street, however, at the point marked C, apparently only a single length of main was blown out; but here the aspect of the houses could only be likened to that which would follow a bombardment. At No. 8 all the windows were broken, even to those in the attic, and very considerable damage was done to the interior, the kitchen, and basement being laid open to the street. No. 7, too, was very much shattered, the roof having been broken through by the falling stones. It is fortunate, however, that, considering the great force of the shock at this point, little or no personal injury appears to have been suffered by the occupants. This cannot be said in reference to the explosion which occurred at the corner of Charlotte Street, at the point marked D on the map. Here, again, only one length of main seems to have been blown out, yet the destruction of property was very great, and severe personal injury was sustained. The house at the south-west corner of Charlotte Street was shaken, though the outward signs of destruction were not so apparent. The next house, however, was greatly injured, the front of the shop being quite destroyed, while the pavement in front, together with the iron railings, were thrown about in the greatest confusion. Here, one of the most serious accidents occurred, two persons—a nephew of the owner of the shop and a servant—being hurled by the reaction of the explosion into the air, and much hurt thereby. Both sustained injuries of exactly similar character—namely, compound fracture of the right leg, and severe scalp and face wounds. In addition, the male sufferer had a simple fracture of the right arm. Next door is the Royal Standard Permanent Benefit Building Society, whose offices were much shattered. The building is a fine specimen of plate glass front gives evidence of the violent shock the premises sustained, which overthrew the iron railings and stonework as well. The roadway at this point was thrown up more violently, perhaps, than at any other spot, though for a shorter distance. Farther on in Charlotte Street, at the point marked E, at the corner of the street called Bedford Street, the effects of the fifth explosion are seen. Here the opening in the ground is wide and deep, and probably six lengths of main were blown up by the force of the shock, which so shook the foundation of the house at the corner as to necessitate its being propped up. A long tract of roadway intervenes before the end of the sixth explosion is reached, the point marked F on the map. This is in front of Nos. 103 and 105, Charlotte Street, the main running along the west side of the street. At the former house the front wall below the pavement was blown away, and until the wall was shored up the house stood in imminent peril. Fortunately most of the occupants were away at the time of the explosion, which appeared to have done but about three lengths of main. Passing on northwards, Howland Street is reached. Here there is a great hole, with the broken valve and main-pipe laid bare, and the fragments of jagged iron, which had been driven along the main by the force of the explosion, were here taken out. An immense hole was made at the back of the house, and the force of the explosion at this distant point, where fortunately all danger of further destruction ended.

Of course with the great disturbance of roadway caused by this unexampled series of explosions, the mains used for the supply of the district with gas were much injured, and were damaged in many places, and the sewers broken into. The immediate neighbourhood was in either total or partial darkness on the night of the explosion; but owing to the prompt measures taken by the contractors, Messrs. Aird, and by the Gas Company's Chief Inspector, Mr. T. C. Hersey, temporary connections were made, and the gas-mains, and the sewers, were repaired by the servants of the West Middlesex Water Company worked with commendable alacrity in order that the inhabitants of the district might receive their usual quantity of water.

Considering the extent of ground covered by this unexampled catastrophe, and the time of its occurrence, it is almost surprising that the personal injuries sustained by pedestrians and others, serious though they have unquestionably been, were not still more lamentable. The man Beavis, when extricated from the main, was quite dead, and his death was probably instantaneous. He was at once conveyed to the Middlesex Hospital, where he died, and the medical officers of the hospital, and the House Surgeon, were sufficient to show that the injuries comprised a comminuted fracture of the left arm, and simple fracture of the left thigh and of both bones of the left leg. The face was charred and contused, thus being rendered almost unrecognizable, and there were indications of the lungs having been injured. The other man, Burr, was carried to the trench and carried to the hospital in a state of unconsciousness and collapse, the result of the severe injuries he had sustained, which consisted of compound fracture of the right thigh and both bones of the right leg, scalp wounds, contusions, and burning of the whole of the face and of the thigh from the knee of the right leg up to the shoulder. The injury to the leg was of so serious a nature that amputation was considered necessary, and the poor fellow succumbed soon after the operation. The other serious injuries were those sustained by a servant at the house No. 3, Charlotte Street, and by a nephew of the landlady, the former of whom when admitted into the hospital was found to have a compound fracture of the left ankle-joint, severe scalp injuries, fracture of two small bones of left hand, and scald on right arm and hand; while the latter was suffering from the effects of the shock, compound fracture of right tibia, and fracture of right forearm. These are fortunately the only really serious cases. The other injured persons, of whom there were about 25 altogether, were either injured by the explosion, were promptly attended to at the Middlesex Hospital, by the senior House Surgeon, Mr. H. A. Smith, and his assistants, who were unremitting in their anxiety to relieve the sufferers, and in most cases they have now been able to return to their homes. Six are, however, still under medical treatment; but happily all are progressing favourably towards recovery. Those who altogether escaped injury—and there were many extraordinary instances of very narrow escapes—have much cause to congratulate themselves.

The varied effects of the explosions will not fail to attract the attention of every observant observer. For example, the Bedford Head Hotel—a fine tavern of essentially the modern class of building, with large plate-glass windows and exterior lamps, which hung almost over the trench in Bayley

Street, is absolutely untouched; while on the opposite side of the street, at a greater distance from the trench, the window of the Bedford Laboratory has been cracked. At other points along the line of the explosion there are similar peculiarities.

It is scarcely necessary to say that the locality has been visited by large numbers of people; but owing to the excellent police arrangements, both on the night of the accident and since, and to the promptitude with which the breaches in the roadway were enclosed by means of barriers, and the damaged buildings shored up, no further disaster or serious breach of the peace has to be recorded.

As soon as possible after the accident gangs of labourers were upon the spot, both from Messrs. Aird and the Gas Company, and they all worked in splendid style during the night and throughout Tuesday. In the night everything had to be done in the darkness, as, of course, it would have been dangerous to have had any light upon the scene until the gas was thoroughly exhausted. The broken mains at Howland Street were speedily plugged with air bags, and the flow of gas was diverted by opening a valve and supplying the district from King's Cross. The result of the efforts made by the workmen was that by Tuesday evening the broken services along the line of the explosion had been sufficiently restored to allow the gas to be lighted as usual. Most of the principal officials of The Gaslight and Coke Company were on the spot in the course of the day following the accident, and the Engineers of the other Companies in the Metropolis tendered their services. Instructions were given as to what was to be afforded to those who were injured or rendered homeless by the calamity.

Of course no end of conjectures have been formed as to the cause of the explosion. That there was an admixture of gas and atmospheric air in what was with perfectly good reason supposed to be a dead main, there cannot be a doubt, and it is very likely that the production of it is useless at present to speculate. It is thought that the passage of some heavily laden vehicle over the valve at Howland Street may have loosened it sufficiently to allow of an escape into the new main of enough gas to form an explosive mixture in different parts of its length, and in the morning papers, larger portions have been rendered thus portions fiery, but not explosive, varying therefore as links connecting the other portions which were fired and exploded in rapid succession. On the other hand, it is asserted that there has for some few weeks past been a constant smell of gas in Percy Street, and it is conjectured that an escape had been going on, and that the escaping gas had somehow or other made its way into the new main. However, conjecture of any kind is useless. The matter is engaging the attention of those most conversant with the subject, and there is little doubt that both in the course of the inquiry into the cause of the death of the two men who were the first to feel the effects of the catastrophe, and in any other official investigation that may be undertaken, the matter will be dealt with. The Gas Company and the Contractors are equally anxious that the fullest light should be thrown on what may be regarded as almost an unexampled calamity in gas engineering.

THE INQUEST.

The inquest on the bodies of Albert William Beavis and William Burr, the two men who met with their death under the circumstances above recorded, was opened on Thursday last, at the Spread Eagle Tavern, Mortimer Street, W.C., by Dr. HADWICK, the Coroner for the Central Division of Middlesex.

Mr. BESLEY appeared on behalf of The Gaslight and Coke Company; Mr. R. E. WEBSTER, Q.C., for Messrs. John Aird and Sons, the contractors for laying the main; and Mr. R. WILLIS, Mr. T. SAMPSON, and Mr. F. G. GORRAN, solicitors, represented various injured persons and owners of damaged property.

Mr. WEBSTER, addressing the Coroner, said: I appear for Messrs. John Aird and Sons, the contractors who were executing the main-laying work for The Gaslight and Coke Company at the time the explosion occurred, and I am desired to say they are most anxious that every possible information should be afforded to the jury. They think it probable that the jury should inspect the open pipes in Bayley Street, and at least one other place. Whatever may have been the cause of the explosion—an explosion unprecedented in the history of gas lighting—they deeply regret the loss that has happened to life and property in the district.

Mr. BESLEY: The Gaslight and Coke Company wish me to say that they, too, are desirous of assisting the inquiry by every means in their power. Plans will be provided for the use of the jury, and the Company's Chief Inspector, Mr. T. C. Hersey, will attend them to the places where the explosions occurred, and explain all details. The Company also deplores the catastrophe, which is certainly without parallel so far as they are concerned.

The jury having been sworn, proceeded to view the bodies. On their return,

Mr. BESLEY said the officers of the Gas Company had informed him that it would be dangerous to leave open those portions of the street that had been affected by the explosion. Unless the jury visited the place to-day, they would probably be unable to see it all.

The CORONER observed that the jury could inspect everything that was necessary when the adjournment took place.

The following evidence was then taken:—

John Burr identified the deceased William Burr as his son.

Mary Jane Day was called to identify Beavis.

Mr. Herbert Arthur Smith, M.R.C.S., L.R.C.P., the senior House Surgeon at Middlesex Hospital, having deposed to the injuries received by each of the deceased, and the cause of death.

William Hawkes said: I am in the employ of Messrs. Aird and Sons, and was engaged as foreman on their main-laying works. I have been occupied in excavation work and pipe-laying all my life. On Monday evening last I was with Burr and Beavis at the trench just outside the Bedford Head Hotel, at the corner of Bayley Street, where the connection of a 36-inch gas-main was to be made. The pipe in its place in the excavation, and the deceased had to cross-cut the lead joint which is run round the plug previous to making the connection. When I last saw them they were cutting the joint out, and I was standing on the top of the pipe. It was between 6 and 7 o'clock. The mouth of the main-pipe was going eastward was open, but that going westward was plugged. It was this pipe we were at work upon. There was no pressure on the main, and we took off the gauge with which we had been testing it to see that it was sound. The pipes running westward had been laid about three months, and so gas had not been admitted into them. There was a 1-inch stand-pipe on the main, and when the gauge was removed we put a light to the stand-pipe, as a precaution before removing the plug. I did this to see whether it was all safe. I applied a common lucifer match to the pipe, and as nothing came out, and it did not seem to draw in, I said to Beavis, "It is all right; we shall not require a bag;" by which I meant the bag of gas which was used to stop the gas. About a minute afterwards there seemed to be a rumbling noise, and then the explosion occurred, blowing out the plug in the pipe. There was a great deal of smoke, but no flame. There was a space of several feet between the ends of the pipes. Beavis

was blown about 24 feet into the pipe on the opposite side of the trench, and was killed, and Burr was lying outside, groaning. While I was getting Beavis out the second explosion occurred.

By Mr. BESLEY: It would be about 13 miles eastward from the Bedford Hotel before you came to the "live" main in the Goswell Road. The "dead" main is shut off from the live main by means of a valve and a cap. The cap is bolted on, so that there is no flow of gas from the live main into the dead one. In speaking of "connection," I do not mean that there was anything being done to cause gas to pass through the main; it is merely getting the pipe ready to allow the gas to pass through when it is turned on. A plug had been put into the main at the point where we were at work. A plug differs from a cap in this, that it is put in with flange, and filled up with lead. For the purpose of making the connection we had to cut out the lead joint, and this was what was being done on Monday evening. We had put on the main a pressure-gauge for the purpose of testing the soundness of the joints. The gauge was on a stand-pipe. Westward of the Bedford Head the live main is a little over a quarter of a mile off, in Howland Street, where the last explosion occurred. The connection with the live main is there cut off by means of a valve, which could be worked from the surface. That valve is broken. I believe there was no gas in the main going eastward.

By the CORONER: The dead main to the westward was blown out of the ground in seven different places, but to the eastward it was undisturbed. The main is laid at a depth of 3 feet from the surface of the ground in Percy Street and Howland Street.

David Winslow said: I am an outdoor superintendent in the employ of The Gaslight and Coke Company, and have been in the Company's service 15 or 16 years. My duty is to inspect the work done by the contractor's men. I have made daily reports as to the laying of this main to Mr. Hersey, the Chief Inspector. Everything appears to me to have been done satisfactorily. I was at the place of the accident on Monday evening about five o'clock, when the men were about to cut the joint of the plug, so as to be ready to make the connection. I am certain there was no gas in the main to the eastward, and I believe there was none in that on the west side; we were shut off by a valve in Howland Street.

By Mr. BESLEY: From Howland Street to the Bedford Head the ground was filled in on the 8th of May, and from the Bedford Head to Goswell Road about last Wednesday week. As far as I know, the main westward to Howland Street and eastward to Goswell Road was dead.

By the CORONER: I am not quite conversant with the job. I was assisted by a man named McCarthy, who had charge of a portion of the work. I am sure there was no leakage of gas into the dead main from the valve in Howland Street. I tried it a week ago, and found no smell of gas. I have no notion how the gas got into the dead main.

Mr. *Thomas Charles Hersey* said: I am the Chief Inspector of The Gaslight and Coke Company, and have had 20 years experience as a Gas Engineer. I had the sole superintendence of the laying of these new pipes, which was being done by Messrs. Aird and Sons. The work was commenced in February this year, and was expected to be completed on Tuesday last. I was at the trench in Bayley Street on Monday, and the connection of the two portions of the main was made, and it was all ready. The west end of the main was closed with an iron plug fixed with lead, but the east end was open.

By the JURY: A main is plugged as a matter of precaution.

By the CORONER: I was certainly not aware of there being gas in the main; and I do not think that any of the men who had come there. The valve in Howland Street was put in under my superintendence, and I know that it was sound and proper. I have no doubt that the explosion was caused through there being gas in the main to the westward. About 5 per cent. of gas combined with atmospheric air would be sufficient to explode at the pressure mentioned, but 10 per cent. would be more dangerous. The main had not been tested with a view to seeing whether gas was present. It is my belief that gas had got mixed with the air in the main, but I cannot account for it. The theory I have formed is that gas must have escaped from a fracture in one of the smaller pipes, and found its way into the main.

The CORONER: You think the smaller mains might leak every day?

Witness: They might and do leak. We have leaks every day in some parts of our district.

Can you tell us what percentage of gas leaks out of the mains?—I could not say, but there is a large loss every day. I do not know it is rather lower than it is in some of the London Companies, but still it is a very large quantity. Sometimes when the ground is thrown up you can smell the gas, and I have seen it accidentally lighted by a spark from a pick.

By the JURY: It is no evidence as to how the gas got into the main; it is merely my surmise.

The CORONER: The joints are of lead. Yarn is rammed in first, then molten lead is run in to the depth of 23 inches.

[Hawkes, the foreman, in answer to the CORONER, stated that there was a standing order against smoking. Beavis never smoked, and Burr but seldom.]

Examination continued: I cannot account for the explosion. I am in the same difficulty upon the subject as every one else. The gauge did not show any pressure on the main, and when the man smelt for gas only pure air came out.

A JUROR: With what object was the light applied?

Witness: That was not done by my instructions.

The CORONER thought the foreman must have had some suspicion that gas was in the main, otherwise he would not have applied the light.

[Hawkes said he merely did it by way of precaution.]

By the JURY: A stand-pipe is a 1-inch wrought-iron pipe fixed into the main, and the pressure-gauge is fixed to the top of the stand-pipe. If the pipe was not properly fixed so that there was an escape, the gauge might not show the pressure properly.

The inquiry was then adjourned to this day, a hope being generally expressed that in view of the importance of the matter under investigation some more suitable meeting-place might be procured than that in which the business had been so far conducted.

On the adjournment taking place, the jury, accompanied by the Gas Company's Chief Inspector, proceeded to view the several points at which the successive explosions occurred, commencing with the place at Bayley Street, and then to the trench in Howland Street. At each point Mr. Hersey answered with the utmost readiness any questions put to him, and manifested the greatest willingness to afford whatever information might be considered likely in any way to assist the jury in their investigation.

ST. PANCRAS BOARD OF WORKS.—The district affected by the explosion lying within the parish of St. Pancras, a special meeting of the Board was held on Wednesday last, at the Victory Hall, near the Bedford Hotel, West-coast, for the purpose of viewing the spot. The Chairman said a very serious disaster had befallen the parish, doing great damage to the property of the ratepayers, for which reason he had called the members of the Board together to determine what steps should be taken.

which I need not add must considerably increase the consumption of gas. Neither should the fact be forgotten that the public lamps are lighted at, as nearly as possible, prime cost, and this is a benefit of no mean order, for by this means have been enabled to make Hamsgate one of the best lighted towns round the coast. It will, of course, be remembered that the public lighting of the town was the primary cause of the disturbance between the Commissioners and the late Gas Company. It will be within the recollection of most of the Council that for a part of one quarter the streets were left unlighted altogether, in endeavouring to combat the exorbitant price sought to be imposed by the Company; but as this resulted in the gas and water concerns being handed over to ourselves, it may now be looked upon as a source of congratulation. It may not be generally known that the price charged for public lamps is 10 per cent. less than to private consumers, and that the rebate will be allowed equally on the consumption of public lamps as on the account of private consumers. The number of lamps, including those in the added area, is nearly 500. I will now refer to the working statement prepared by Mr. Alfred Lass, which I may safely designate one of the most satisfactory ever presented to a company or corporation. The gas made, as per station-meter, was 79,048,000 cubic feet, leakage or unaccounted for gas being only 471. The gas sold per ton was 9563 cubic feet, which is the average make in most works from a ton of coal. The return for residual products is also very satisfactory, the net proceeds for coke and other residuals on the cost of coal being 50/3 per cent., or a return of more than one-half per cent. The waste of sulphate of ammonia, and the quantity of sulphate of ammonia being disposed of, as the manufacture of this article has only just commenced, but from this source the Committee may expect a large return during the current year. The works themselves are, I believe, as complete as forethought, design, and care can make them. The output of the works is estimated at from 15,000 to 20,000 tons of coal per annum, the salt produced being of the best quality, as shown by Dr. Voelcker's certificate, containing, as he says, 24.71 per cent. of fixed ammonia, the maximum quantity being 25 per cent. The fuel used was 20 per cent., and the average price of coke was 2s. 2½. The works are, I think, well managed, and my remarks on this head must be equally laudatory as with the gas, for you were solemnly warned, in purchasing this concern, of its rottenness (which has been discovered), and the positive loss which would result in attempting to supply water to the town. No doubt the "croakers" were perfectly correct as to the state of the water services, and all the credit is due to the quality of the then existing source to keep the town properly supplied; and here again the Committee had to deal promptly with a condition of things to enable them to continue a satisfactory supply, and also to carry out the work necessary to meet the requirements stipulated for in their Act of Parliament for giving a supply of water to the town. Nevertheless, although the Committee have been compelled to go to the limit of their power to raise money at the capital they are empowered (except what may be granted in the Provisional Order), they have, contrary to predictions, been not only able to pay interest on the outlay of the necessary capital, but also to spend out of revenue a reasonable amount for repair and maintenance of works, still leaving a balance in hand. The result of all this will be seen in the position of the gas and engines, fair wear and tear excepted, may not now be expected to require any large outlay for some time hence. It is a source of congratulation to see the success which has attended the extension of the adits, by which the original supply has been nearly trebled, thus giving not only the advantage of an ample quantity, but will relieve you of the necessity of keeping up two stations. The well at Southwood being no longer required, the whole of the pumping will be done at Whitehall. The Committee have, as explained in the report, provided for the higher levels by erecting a tower covered with a tank 50 feet by 80 feet by 10 feet, having a capacity of 50,000 gallons, and at a height of 110 feet above the level of the sea, and the present reservoir the lower levels. It has also been resolved to lay services for constant supply free of cost, the Committee feeling they were dealing with a difficulty which could not be met in any other way whatever. A large expenditure has, as will be seen by the balance sheet, been made in the last year, and it is to be expected that the building sites in different parts of the town, the total quantity of all sizes amounting to about 6½ miles. As stated in the foregoing, the expenditure has been met by the existing rates, and it is hoped you will be able to continue doing so, although some alterations will, of course, be rendered requisite. By the extension of the adits, it will be seen that the Committee have the present excessively low water-rate. The Committee have finished driving tunnels, a work which has extended over twelve months, and in the course of a few days the adits will be closed, we hope for some years to come. The Committee are endeavouring to put both their gas and water works in a substantial repair and good working order, and thus enable them to meet the present demand, and provide intelligently and economically for the increased requirements of the future; believing in the sound commercial axiom that "it is not they who spend least who are the greatest economists, but those who spend most judiciously."

Mr. Roon said the Gas and Water Committee deserved the thanks of all the inhabitants of the town as well as the Board, and he wished to move a vote of thanks to the Chairman and to the Committee.

Mr. BARNES seconded the motion.

Mr. HICKSON said he went over the works the other day, and he considered that the thanks of the Board were also due to Mr. Valon. The buildings there were in a grand state of repair, and he thought they would have something for the money expended. The works were planned and carried out in the best possible manner, and in a way which reflected the greatest credit on Mr. Valon. He was very glad they had not interfered with that gentleman's duties at the gas-works, by giving him other work, and he trusted Mr. Valon would be able to continue his services for a very long time, where he would be a most valuable servant to the Board.

Mr. Roon said he was quite willing to include Mr. Valon in the vote of thanks, which was then passed, and the Board adjourned.

THE HANLEY TOWN COUNCIL AND THE BRITISH GAS COMPANY.

The Usual Monthly Meeting of the Hanley Town Council was held on Tuesday, the 29th ult.—the Mayor (Mr. J. Bromley) presiding—when the following report was presented:—

At the Meeting of the General Purposes Committee on the 2nd of June, Mr. Hanley reported the result of the Committee of the Local Board of the British Gaslight Company. It was moved by Councillor Hammersley, and seconded by Alderman Powell—"That the best thanks of the Committee and the Council be given to the gentlemen who have been instrumental in procuring the passing of the Bill of the British Gaslight Company." This resolution being carried, it was also resolved—"That the best thanks of the Committee be given to those members of the Council who, at the instance of Mr. Hanley, have rendered valuable assistance in the opposition of the above-named Bill." It was moved by Alderman Powell, and seconded by Alderman Ridgway—"That the opposition of the Bill be continued in the House of Commons."

Alderman GIBBS moved the confirmation of the report, observing that the Corporation had obtained nearly all they wanted in the Lords, and if they pursued the opposition to the House of Commons he had no doubt whatever they would then get everything they wanted.

Alderman CANTLEIDGE seconded the motion.

Mr. MILLER thought that the opinion of the Council should be canvassed on the question of further opposition to the Bill. They had been told that the Corporation had obtained nearly all they wanted, but he (Mr. Miller) could not for the life of him see what it was they had gained. They had really gained nothing, but had lost something, for they had lost the cost of the opposition, and as the ratepayers were already clamouring against this, he considered that it would be unwise to follow the Bill to the House of Commons, and incur further expense. To do this would be neither just nor right. The ratepayers had been put to great expense when they could have afforded to do so in any indirect way the gas consumers would have to pay the Company's expenses, and as the gas consumers were also ratepayers they would have to pay in a twofold way. He moved as an amendment that the portion of the report relating to the further opposition of the Bill be not adopted.

Mr. BRADY seconded the amendment, and complained of the sparing manner in which the General Purposes Committee had dealt with the matter. The report did not tell them anything of what the Corporation had done. All the Committee seemed to have done was to pass resolutions thanking themselves for doing nothing. It was, perhaps, might be little satisfaction to those who had some qualms of conscience as having fought another losing game; but he was anxious to know what they had to thank these gentlemen for. He did not see what they had done; but everybody knew what they had not done. All they seemed to have achieved was a reduction of the capital the Company saved for £2400, and the ratepayers were estimated to make a difference of £2400 a year. As regarded the former, when a Company sought such powers from Parliament they never expected to have all they asked for, therefore they had obtained now, no doubt, more than they wanted; and as to the latter, what difference would it make to the consumers?

Mr. BRADY said that this would be gained only under circumstances which he believed would never occur; and he again protested against spending further money in going to the House of Commons for what had been refused them in the House of Lords. He urged that it would be unkind to put ratepayers to further expense.

Mr. COOKE contended that the Council had gained a great deal by their opposition to the Bill, and reviewed the progress they had made since the Corporation offered the opposition in 1877. He said that, not only by the recent opposition had the proposed expenditure of the Company been reduced one-half, from £5000, to £2500, and the rate of interest, which they had reduced from 14½ per cent. to 10 per cent.; and the Corporation had also gained power to go to the Company's offices at any time and examine the quality of the gas. The recent opposition had only cost about £800, and he did not think it probable that the opposition before the House of Commons would cost less than £1000, therefore, he urged the Council to continue the opposition, and argued that the cost of the Bill would be little indeed to the ratepayers compared with the advantages they would gain. The tendency of modern legislation had been to take from unwilling sellers that which was for the public good. It was no injustice to the Company to make them sell their works; for they said themselves that they would make them sell their works, and that they would not rival the Company would be far different if they were—but a public body, and they offered to the Company £3 5s. for every £1 they had laid out, with the full assurance that they could make the undertaking pay. It came out in London that the Company were paying 50 per cent. more for coal than was paid at Stoke, and that they sold their residuals at about 50 per cent. less. He then defended the gentlemen to whom it was proposed to give the votes of thanks, observing that the resolution was not passed by those who went to London, but by the other members of the Committee, and most of the gentlemen in question were not members of the Committee at all, but gentlemen from neighbouring towns, who had been to London to give evidence for the Corporation.

Mr. BRADY said his remarks were intended to apply to those who went to London as part of the deputation, but not to give evidence.

Mr. COOKE said that surely such gentlemen as the Mayor of Stoke, the Mayor of Burn, and the Chairmen of the Local Boards, who had the thanks of the Council for going to London for them; as did also the members of the Council who, at the sacrifice of time, business, and personal comfort and convenience, also went.

Other speakers defended the action of the Committee; and, upon the amendment being put, only the mover, seconder, and Mr. Turner voted for it.

The motion was then put as a substantive one, and carried.

Last Thursday's *Staffordshire Sentinel* says: "It is rumored that the Gas Committee of the Blantyre Town Council has made an offer of £180,000 to the British Gaslight Company for their Hanley undertaking—not as a conclusive sum, but as a basis for negotiations. It is understood, however, that the offer has been rejected by the Company." We have not heard any confirmation or denial of this rumour.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

A reduction in the price of gas amounting to 10d. per 1000 cubic feet—from 6s. 6d. to 5s. 6d.—has been made in Glasgow and Dundee, and in consequence a reduction has also been made in the meter-rent, from 2s. 6d. to 2s. per annum.

At a recent meeting of the Blantyre Gas Company, Limited, it was agreed to reduce the price of gas from 5s. to 4s. 7d. per 1000 cubic feet.

The Rating Committee of the Edinburgh Borough Gas Company, after having been meeting in London on the 5th inst., when the accounts for the past year, together with the prospective accounts, were submitted. After they had been fully considered it was unanimously agreed to recommend to the Commissioners a reduction of 5d. per 1000 feet in the price of gas. The present rate is 6s. per 1000 feet, at which it has stood for a number of years.

The annual meeting of the Kilwinning Gaslight Company was held last Tuesday—Mr. T. Fulton presiding. The Directors laid before the meeting the printed accounts of the revenue and expenditure for the past year, being the 43rd balance-sheet, prepared by the Company's Auditors.

The Company was resolved that the price of gas for the current year should be continued at 4s. 2d. per 1000 feet; and in terms of a recommendation from the Directors, it was agreed to declare a dividend of 8s. per share from the profits of the past year.

On Wednesday last the Shareholders of the Ayr Gas Company held their 38th annual meeting in the Town Buildings. Dr. Ronald, Chairman of the Board of Directors, occupied the chair. The Directors reported that their accounts for the year ending 1st of February last had been examined by Mr. Robert Cameron Cowan, the Auditor of the Company. They proceeded to say that the increased demand made upon them for gas, they had taken down the older bench of retorts, and rebuilt it on an improved principle, that the retorts now amounted to 44, and that the whole works were in excellent repair. The average illuminating power of the gas supplied during the year was 27 candles, and the price

5s. per 1000 feet, at which it is to be continued. A dividend of 7½ per cent. was declared—the same as last year. On the motion of the Chairman, the retiring Directors—Mr. Cuthbertson, Mr. Robertson, and Mr. Bayne, —were unanimously re-elected.

The Newton-on-Ayre Gas Company held their annual general meeting on the 1st inst., when a dividend of 7 per cent. was declared, being 1 per cent. better than last year. It was resolved to continue the price of gas at 5s. 5d. per 1000 feet, as against 5s. across the river in Ayre proper.

A dividend of 6 per cent. on the profits of last year was declared at the annual general meeting of the Shareholders of the Blaigrowie Gas Company, which was held last Wednesday.

The annual meeting of the Couper-Angus Gaslight Company was held in the Royal Hotel last Wednesday—Mr. David Buttar, of Corston, in the chair. The report of the Directors showed that the quantity of gas sold during the past year exceeded that of the preceding, that a number of new pipes had been laid in the place of old ones, and that the leakage had been very much reduced. A dividend of 7½ per cent. per annum was declared—the same as it has been for some years past. It was agreed to reduce the price of gas from 7s. 6d. to 7s. 1d. per 1000 cubic feet. The report was adopted, and Messrs. Buttar, Lawson, Lowson, Robertson, and Inches, were elected Directors for the year, the two first named being re-elected.

A dividend of 7½ per cent. has just been declared by the Leslie Gas Company, and the price of gas is to be continued at 5s. 10d. per 1000 feet.

At the annual general meeting of the Austruther and Cellardyke Gas Company, held last Wednesday, Mr. Murray, J.P., in the chair—it was unanimously resolved to pay a dividend of 8 per cent., and a bonus of 5 per cent., and to reduce the price of gas from 5s. 10d. to 5s. per 1000 feet. Bailie Sharp and Messrs. Mackintosh and Adamson were appointed Directors in room of those retiring, and Bailie Darnie and Mr. Fortune were elected Auditors.

The Shareholders of the Kierriemuir Gaslight Company held their annual general meeting last Thursday—Mr. John Ogilvy, Chairman of the Company, presiding. The Secretary submitted the annual report, which was approved of. A dividend of 3 per cent. on the increased stock of the Company was declared, being equal to 7½ per cent. on the original stock. In consequence of the large outlay in connection with the extensions and improvements of the works this year, no alteration was made in the price of gas.

On Monday, the 5th inst., the annual general meeting of the Brechin Gaslight Company took place, when a dividend of 12½ per cent. was declared, being 25 per cent. on the original 45s. shares; and the price of gas was continued at 4s. 7d. per 1000 feet.

At the annual meeting of the Althg Gas Company, held on Monday last week—Mr. G. Duncan in the chair—it was resolved, in view of the Company not being so prosperous during the past year, to limit the dividend to the Shareholders to 6 per cent., being 2 per cent. lower than what was divided in some previous years.

The annual general meeting of the Crieff Gaslight Company was held on Monday, the 5th inst.—Dr. Melkie, Chairman, presiding. The accounts of charge and discharge, for the year ending June 15 last, were read and approved of. The retiring Directors—Messrs. P. Hamilton, T. H. Melkie, M.D., and J. Adie—were re-elected. Mr. R. Clark was elected a Director in room of the late Mr. Ironside, and the Rev. John McDougall, of Orchill, in the room of the late Mr. Brown. The Rev. Dr. Cunningham and Mr. John McLeod were re-appointed Auditors for the ensuing year. A dividend at the rate of 10 per cent. was declared.

Edinburgh gas stock was selling at 445 15s. per share on Tuesday of last week, and on the following day buyers were offering an advance of 5s.

per share. On the same day the Glasgow Corporation 9 per cent. gas annuities were selling at £221 per share.

The Banff Gaslight Company have reduced the price of gas to 6s. 6d. per 1000 feet, and allowed a discount of 5 per cent. to consumers to the extent of £15 worth of gas per annum.

A good deal of excitement was shown in the Glasgow pig iron market last week, accompanied by considerable fluctuations in price. Business was done on Friday afternoon at 52s. cash and 52s. 1½d. one month, and a large amount of business was done in warrants during the day.

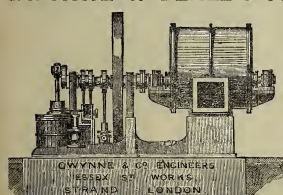
The coal market continues much in the same condition that has prevailed for several weeks past. Orders for all kinds are scarce, and values are low.

REDUCTIONS IN THE PRICE OF GAS.—At last week's meeting of the Salford Town Council a recommendation of the General Gas Committee in reference to the price of gas was agreed to: "That the price of gas be reduced from the 1st of July as follows:—From 3s. 3d. per 1000 cubic feet to 3s., to consumers within the borough of 250,000 cubic feet per quarter; from 3s. 4d. per 1000 cubic feet to 3s. 1d., to consumers within the borough below 250,000 cubic feet per quarter; from 3s. 10d. per 1000 cubic feet to 3s. 9d., to all consumers within a radius of five miles from the Regent Road works."—The Directors of the Kidderminster Gas and Coke Company have announced that for the quarter ending Sept. 30, and until further notice, the price of gas will be reduced 8d. per 1000 cubic feet. The following scale of charges will, therefore, rule for a quarterly consumption under 50,000 feet, 3s. 1d., 50,000 and under 250,000 feet, 3s. 3d.; 250,000 feet and upwards, 3s. 1d.—The Uttoxeter Gas and Coke Company, Limited, have again reduced the price of gas from 4s. 2d. to 3s. 9d. per 1000 feet; with a discount of 10 per cent. to all consumers of 30,000 feet and upwards in a year.

EMPLOYEES OF THE CRYSTAL PALACE DISTRICT GAS COMPANY.—It has now for many years past been the custom for the Directors of the Crystal Palace District Gas Company to provide the funds necessary for the whole of the employees of the Company, together with their wives and friends, to enjoy annually a day's holiday together, the numbers pretty well evenly divided, so that by a little arranging the Company's operations are not interrupted. This year the place decided upon for visitation was the Alexandra Palace, and thence by special train the first half were taken last Tuesday. The Palace was reached by 11 o'clock, and the programme of amusements, at this well-known place of resort in London, was extensive and varied enough to afford a thoroughly pleasant day for every one—whatever his or her tastes and inclinations. Dinner was served in the large saloon at one o'clock, and a very substantial meal was provided; after which Mr. Magnus Ohren, the Secretary of the Company, proposed "The Health of the Directors of the Crystal Palace District Gas Company," by whose liberality those present were enjoying a day's outing, while the rest of the employees would be similarly treated a week hence (to-day). With the toast Mr. Ohren coupled the name of the Engineer (Mr. C. Gandon), a proposal which met with most enthusiastic reception. Mr. Gandon, in responding, expressed his thanks for the flattering manner in which the mention of his name had been received; referred to the way in which Mr. Ohren was instrumental, years ago, in commencing such excursions as the present; and assured all of the kindly feeling he entertained for those with whom he was brought in contact in their daily work. The company then separated to resort again at five o'clock for tea; and the return journey commenced at eight o'clock, all being safely landed about half-past nine, after what may be considered a highly successful day's pleasuring.

The GRAND MEDAL OF MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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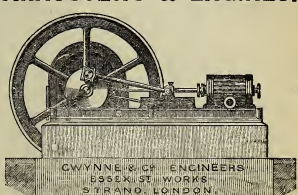
EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make the price the chief of consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

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52,500 EXHAUSTER, with Horizontal Engine combined.

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Of every size and shape, and of the best quality; also of White and Coloured GLAZED BRICKS, SANITARY PIPES, &c., &c.

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WANTED, two active and experienced men as **WATER-WORKS FITTERS** to the Luton Water Company. They must be able to Lay Pipes, Attach Lead and Iron Services, do Plumbing, and be well up in Water-Works matters generally. They must be steady, industrious men, and well recommended.
Apply, stating age, wages required, with other particulars, to **Mr. T. F. MIDDLEMISS, Engineer and Manager, Water Company's Offices, Luton, Beds.**

FOR SALE—Single Gasholder, 158 ft. by 304 ft. in good condition, to be taken out early next year, and replaced by S. C. & Sons with a Treble Lift. Excellent Guide Framing, consisting of 20 handsome Columns and wrought-iron Girders. May be seen at the Gas Works, Farnham.
Particulars on application to **S. CUTLER and Sons, Millwall, London, E.**

ON SALE—The Cast-Iron Fire Doors, Mouthpieces, Assemblies, H. and Dip Pipes, Hydraulic Mains, &c., belonging to six settings of its retorts; also one Station Meter to pass 8000 feet per hour (makers Vaux and Grogan).
The above are in capital condition, and can be seen at the Gas-Works, Guildford. No reasonable offer refused.
Particulars on application to **Mr. Loxworth, Gas Office, Guildford.**

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned **APPARATUS** for Sale about the beginning of August, viz.:

About 150 feet of D-shaped Wrought-Iron Hydraulic Main, size 19 in. by 19 in. About about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.
Scrubber (Round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.
Exhaustor (Jones) to pass about 15,000 feet per hour.
Exhaustor (Beales) to pass about 25,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
4-horse power Horizontal Steam-Engine.
Three 4-in. Pumps, with cranked Shafting and a pair of Mire Wheels.
Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.
Gasholder, Double Lift, capacity 100,000 feet.
Gasholder, Double Lift, capacity 240,000 feet.
One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned.
H. MORELAND, Engineer.

CIRENCESTER GAS COMPANY, LIMITED.
THE Directors are prepared to receive TENDERS for the Supply of 800 Tons of Best Old Silcock GAS COAL, 1000 Tons of Best Forest of Dean GAS COAL, and 300 Tons of through Welsh COAL to be delivered at Cirencester Station during the next Twelve months, in such quantities and at such times as the Company's Manager may direct.
Also for the Purchase of the Company's COKE, to be removed from the Works as required by the Manager.
Tenders to be sent to **J. BUCHAN, Secretary to the Gas Company, 76, Castle Street, CIRENCESTER**, on or before the 26th of July inst.

GAS PLANT FOR SALE.

THE Maidstone Gas Company having enlarged their Works, offer the following Apparatus for Sale in good condition:—

SCRUBBERS—One Tower Scrubber 30 ft. high by 10 ft. diameter, with Distributor, and partly fitted with Livesey's boards.
CONDENSERS—One Set of Annular Condensers, consisting of 9 Pipes 17 ft. high, outer diameter 2 ft. 6 in., fitted with 12-in. Valves complete.
ENGINES—Two 12-Horse Power Horizontal Engines in very good condition.

STATION-METER—By Milne and Son, in first-class condition, ornamental case, with Valves and Bye-pass complete; to pass 20,000 cubic feet per hour.
HYDRAULIC MAIN—Six 8 ft. by 18 in. Hydraulic on D wrought iron; 24 ft. 8 in. by 18 in. Hydraulic Main D wrought iron. Nearly new.

BRIDGE and ASCENSION PIPES—90 ft. by 4 in. Bridge-Pipes, and a quantity of 6-in. Ascension-Pipes and Bends.

RETORTS—31 Rounds, 15 in. diameter and 9 ft. long, in two pieces. 2 Ovals, 21 in. by 15 in. and 9 ft. long, in one piece. All of Stourbridge Fire-Clay, and in good condition.

For further particulars and price apply to
JOHN WEST, Engineer and Manager.
Gas Works, Maidstone, April 21, 1880.

TO GAS AND PETROLEUM CONTRACTORS.

THE Local Board of Health for the Dis- trict of Watford, Herts., are prepared to receive TENDERS for LIGHTING the PUBLIC STREET LAMPS belonging to them, with Gas or Petroleum, or by other means, for Twelve consecutive calendar months, commencing on the 14th of August next.

The specification can be inspected on application to **Mr. C. C. Loxley**, the Board's Surveyor, on and after Wednesday, the 14th inst.

Sealed tenders, marked "Tender for Lighting," must be delivered at this Office not later than 6 o'clock p.m. on Thursday, Aug. 8 next.

The Board do not bind themselves to accept any tender.

By order of the Board,
JOHN SIDGWICK, Clerk.
66, High Street, Watford, July 9, 1880.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Radcliffe and Pilkington Gas Company are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Works, Egerton Street, Radcliffe, for the period of One year from August, 1880.
Any further information may be obtained on application to the undersigned, to whom tenders, stating the price per ton of 20 cwt., must be sent on or before the 25th inst.
The Directors do not bind themselves to accept the highest or any tender.

ANDREW DUGALL, jun., Manager and Secretary.
Gas-Works, Radcliffe, near Manchester, July 9, 1880.

TO COAL MERCHANTS.

THE Directors of the Radcliffe and Pilkington Gas Company are prepared to receive TENDERS for the Supply of Best Screened GAS COAL and CANNEL, to be delivered at the Radcliffe Goods Station in quantities as they may from time to time require, for a period of One, Two, Three, or more years as may be agreed upon, commencing Dec. 1, 1880.

It is estimated that 6000 tons of Coal and 3000 tons of Cannel will be required per annum.

Persons tendering are requested to name the colliery from which they propose to supply.
Tenders must be sent to me on or before the 26th inst.
The Directors do not bind themselves to accept the lowest or any tender.

ANDREW DUGALL, jun., Manager and Secretary.
Gas-Works, Radcliffe, near Manchester, July 9, 1880.

CONTRACT FOR GASHOLDER, &c.

THE Mayor, Aldermen, and Burgesses of the Borough of Aberavon invite TENDERS for the Construction of a GASHOLDER, 30 ft. in diameter and 16 ft. high, and for the construction of TWO PURIFIERS, 5 ft. by 8 ft. by 4 ft., with Lifting Apparatus and Centre-Valve and Connections; according to plans and specifications copies of which can be had on application to **Mr. John Henderson, Manager of Gas-Works, Aberavon, South Wales**, on payment of half a guinea.
Sealed tenders to be lodged with **MANUEL TERNANT, Esq., Town Clerk, Aberavon, South Wales**, on or before the 26th of July inst.

WEST BRONWICH.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the West Brom- wich Improvement Commissioners are prepared to receive TENDERS for the Purchase of the Surplus GAS TAR (say 900 tons) for the year ending July 1, 1881.
Sealed tenders addressed to me, and endorsed "Tender for Gas Tar," must be delivered here before Tuesday, the 20th of July inst.

Further particulars and forms of tender may be obtained on application to me.

The Committee do not bind themselves to accept the highest or any tender.

CHAS. H. BAYLEY,
Clerk to the said Commissioners.
Town Hall, West Bromwich, July 8, 1880.

WEST BRONWICH.

AMMONIACAL LIQUOR.

THE Gas Committee of the West Brom- wich Improvement Commissioners are prepared to receive TENDERS for the Purchase of AMMONIACAL LIQUOR produced at their Albion Works, West Bromwich, for a period of two, three, or four years. Separate tenders for each term required. The Liquor to be delivered into Cinal barges at the Albion Gas-Works.

Further particulars and forms of tender may be obtained on application to me.

Sealed tenders addressed to me, and endorsed "Tender for Ammoniacal Liquor," must be delivered to me before the 20th of July inst.

The Committee do not bind themselves to accept the highest or any tender.

CHAS. H. BAYLEY,
Clerk to the said Commissioners.
Town Hall, West Bromwich, July 8, 1880.

LOCAL BOARD OF HEYWOOD.

TO CONTRACTORS AND BUILDERS.

THE Heywood Local Board are prepared to receive TENDERS for the following:—

Contract No. 1.—The Erection of a PURIFYING HOUSE of Brick relieved with Stone, on the site of their Gas-Works, Hooley Bridge, Heywood.

The drawings and specification may be seen at the Board's Offices, and at the Offices of the Engineer, Mr. Thomas Newbwing, 5, Norfolk Street, Manchester. Copies of the specification, bill of quantities, and form of tender may be obtained on application to the Engineer, or to one of the Clerks, on payment of one Guinea, which will be returned on receipt of a bond sealed tender.

Sealed tenders, endorsed "Tender for Purifying-House, Contract No. 1," to be addressed to the Chairman of the Gas Committee, and delivered to the undersigned not later than the 26th of July inst.

The Board do not bind themselves to accept the lowest or any tender.

By order,
JOHN BAKER, Clerk to the Local Board.
Office of Local Board, Heywood, July 12, 1880.

RAMSGATE IMPROVEMENT COMMISSIONERS, GAS AND WATER DEPARTMENT.

GAS-WORKS.

THE Gas and Water Committee invite

TENDERS for Cast-Iron PIPES and Special Castings, together with about 30 tons of Wrought-Iron Girders and 55 tons of 1-in. Cast-Iron Floor Plates, particulars of which may be had and drawings seen on application.

WATER-WORKS.

Tenders are also invited for about 7200 ft. of 18 in. Iron Pipe; 7000 ft. of 14 in. Iron Pipe; and 510 ft. of 12 in. Iron Pipe, together with from 30 to 40 tons of Special Castings, particulars of which can be obtained on application.

Tenders, which must be sent in not later than 10 a.m. on Thursday, July 15, addressed to the Chairman of the Gas and Water Committee, Gas-Works, Ramsgate, to state price per ton for Special Castings, and per foot run for Pipes.

The Committee do not bind themselves to accept the lowest or any tender.

WILLIAM A. WALTON, Engineer.
July 1, 1880.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,

WITH OR WITHOUT

WROUGHT-IRON SPINDLES AND
ENGINES COMBINED.

GEORGE WALLER & CO.,

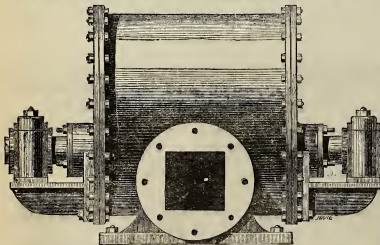
MAKERS OF

ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

PHOENIX ENGINEERING WORKS:

HOLLAND STREET, SOUTH WARK, S.E.



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TO CORRESPONDENTS.

W. B.—The Company have no remedy against the consumers. They might, under section 18 of the Gas-Works Clauses Act, 1871, have taken security for "the safety and return" of the meter; but not having done so, cannot claim its value.

A. A. C.—Received.

W. L. C.—In Messrs. Michael and Wills's book, "The Law relating to Gas and Water," the question you mention is dealt with in the introduction (second edition, p. 34), where, when speaking of non-statutory gas companies, the authors state that "every opening of the roads or streets is a nuisance at common law, and the company or proprietor may be proceeded against by indictment for every such offence;" and continue: "Neither can any public body in whom is vested the charge of streets and roads give such permission as will obviate the liability to proceedings against the proprietors. But it has been held by the Court of Queen's Bench that it is not illegal to grant to a gas company a licence to break up the streets, and that such breaking up is not necessarily a nuisance. It may now be taken as settled that the High Court of Justice will not grant an injunction to restrain a company without parliamentary status from opening the streets to lay mains and service-pipes to supply gas to houses; but the common law liability to proceedings cannot be avoided without parliamentary sanction for the works."

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

TO SUBSCRIBERS.

Subscribers who desire to avail themselves of the reduction in the subscription to the JOURNAL by paying in advance for the second half of the year 1880, are reminded that this can only be done during the present month.

Subscribers who have not paid their subscriptions for this, or for any previous year, are requested to remit the same forthwith to the Publisher, in order to prevent any interruption in the regular delivery of the JOURNAL.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 20, 1880.

Circular to Gas Companies.

THE inquiry into the cause or causes of the recent explosion in Tottenham Court Road was completed on Tuesday last, and all that will be known on the matter is now before the public. We are obliged to express our regret and disappointment at the manner in which the case has been investigated, and at what we regard as the unsatisfactory conclusion reached. An inquiry into an occurrence which is without precedent, and which involves the necessity for some technical and scientific knowledge, is clearly not happily placed in

the hands of a coroner's jury, even when its members are prepared to give unlimited time to the pursuing of it. When, however, as in this case, there are repeated intimations of an impatient desire to come to a conclusion at the earliest possible moment, the chances of a satisfactory issue are still more remote. Had the coroner's inquiry been confined to the mere ascertaining and certifying of the cause of the deaths, and some man of suitable experience and training—say Mr. Vernon Harcourt—been entrusted with the scientific investigation of the explosion itself and its causes, there would have been almost a certainty that those causes would have been marked out with accuracy. We should thus have had the one satisfaction possible from so melancholy a circumstance—it would have served as a beacon to save others from like catastrophes in the future. As it is, the public are asked to believe that this most sad and terrifying occurrence is one which those who should know most on the matter are quite unable to explain; that its cause is a mystery impossible of determination in this case, and therefore beyond the possibility of providing against for the future; and consequently that, so long as they cannot dispense with the use of gas, they must be prepared for a repetition of such scenes as have been recently witnessed. As remarked last week, not the least of the evils resulting from the disaster is the feeling of vague alarm which it has created in the minds of a large number of people—an alarm which Gas Companies have no right, even if they can afford, to disregard. We hold that every effort should be made to remove this erroneous idea of danger, and therefore repeat our regret that the inquiry did not establish beyond doubt the cause of the accident, and so afford an assurance that it would not recur.

It will be seen from the report we publish this week of the evidence given at the adjourned inquest, that the theory suggested by the Gas Company on the first day, although not abandoned in so many words, was really surrendered. This theory was that gas which had escaped from one or other of the small pipes in the streets traversed by the large main, saturating the loose earth under the paving, had found its way into the new main through a fracture in one of the lengths. We remarked in our last "Circular" that the probabilities were against this theory, but anticipated that it had some foundation in facts known to the Company's officers, of which evidence would have been forthcoming. As no such evidence was furnished, we assume that it did not exist, and that this idea was put forward only because of the unwillingness of those who suggested it to believe in the possibility of the valve leaking. Probabilities were, on several grounds, against the suggestion. Considerable as is the waste from gas-mains occasionally, they are usually soon discovered and made good, especially when the attention of the Company's officers is being directed day after day to the particular neighbourhood of the escape. The smaller service-mains are generally at a less depth than the large trunk-mains, and the escaping gas would be more likely to find its way up through the pavement than to go down in search of another outlet. Again, a fracture in a pipe proved as these were is almost impossible, except at one of its extremities. A split at the plain end would have been seen by the workmen, and the main rejected, and if a socket had been opened in setting up, even if it had been passed by workmen, foreman, and inspector, the lead and yarn of the joint would leave very little room indeed for the ingress of gas, although backed (as it could not have been in this case) by some pressure. It would, in our opinion, have been better, as this theory, hastily put forward, could not be supported, that it should have been withdrawn. At the time it was being considered there lay a main three times the length of that in which the explosion took place, and of the same large size, extending, as we explained last week, from Tottenham Court Road to Goswell Road, still charged with air, because gas had not yet been turned into it. That no apprehension of danger was felt in reference to this main is a proof that no strong faith was felt in the theory. Had it been well founded, Gas Companies would have been guilty of criminal carelessness henceforth, if, in laying new mains, they had not from day to day blown out the air from the length completed, letting the gas follow up the workmen as they proceeded. We have felt it necessary to dwell on this suggested explanation of the accident, because of the source from which it came, and also because it is the only alternative to that which the jury, we believe rightly, found to be the true cause—the passage of gas through the valve.

The evidence given as to the proving of the main showed that while it was sound enough to warrant the Chief Inspector in accepting it as practically perfect, it was no

so sound as the other section was reported to be. We mentioned last week how small was the quantity of gas—less than one foot per hour—which needed to find its way into the main to form the explosive mixture, and there is nothing in the report of the proving to make us doubt that the valve let pass to this extent. We need hardly remark that a very much smaller opening or leakage in the valve would suffice than would be required in the main itself. The former would pass, uninterruptedly, a quantity of gas varying only with the pressure in the live main; in the other case, an opening which would let in enough gas in the fitful way that would be alone possible, and without pressure behind it, would have let out so much of the air pumped in as to have made it impossible to pass the main as satisfactorily finished.

The lesson to be learned from this unfortunate occurrence is a very clear one. It is not right to trust to any valves as absolutely sound when used in the public streets. This was clearly Mr. Hersey's opinion when, having fixed the valve in question, and laid a few pipes across the street in which it was placed, he removed the men to the other extremity, and laid the main back towards the valve. It was also the opinion of the foreman, Hawkes, who tested the new main with a light, contrary to custom, and "as a precaution," although he knew that no gas had been let into it. Had the two sections of the main been completed at the same time, and the connection made, or had the coupling of the short length from the valve in Howland Street with the section completed in May, been delayed until the whole was finished in July, no harm would have ensued, and this sad experience would not have been gained. If it was necessary to join up to the valve so long before the main was to be put into use, then the event has proved that it would have been better to blow out the air from that section at once, and make the final connection in Bayley Street with gas in the pipe. Our desire in these observations has been to make clear, so far as we are able, what is, after all, a very simple circumstance, serious as were its consequences. We feel that no blame is attachable to any one concerned in the matter, and that our sympathy is due to Mr. Hersey and Messrs. Aird and Sons in the great pain and anxiety which it must have caused them. At the same time we hold that if, after the experience so sadly gained, a similar accident should again occur, nothing could relieve those engaged in the work from the gravest responsibility, except ignorance of the facts of this case.

The members of the Société Technique de l'Industrie du Gaz en France—the French equivalent for our British Association of Gas Managers—have just held their annual "congress," which was opened with a very interesting address by the President. M. Jordan, as stated by himself, is connected with the iron industry quite as deeply as with gas, and by virtue of his semi-independent position he claimed the right of being heard as an unprejudiced observer on the question of the continued existence and development of gas lighting, in view of the competition which at this time, more than ever, is forced upon it by its many rivals. The address, indeed, was chiefly concerned with this important subject, upon which the President's judgment was eminently calculated to reassure his hearers. But besides the vindication of those concerned in the manufacture of gas from the charges which the advocates of rival systems of lighting level against them, in France as elsewhere, there were portions of his address which offer much food for reflection to sympathizing and interested outsiders. For instance, in the allusions made to the various devices by which gas undertakings in France are made to yield revenue to the State and Local Authorities, we obtain instruction illustrative of the extraordinary propensity of the French bureaucracy for raising, by indirect and roundabout means, money which, by the way, they appear just as willing to expend in a similar manner, if we may judge from the latest proposal to subsidize French steamship owners, with the ulterior object of fostering a native merchant service. It gives one an impression that in following out this general idea of taxation, the French authorities hold the belief that money so raised comes into existence by some special creation, instead of out of the pockets of the people, and that they think the long-suffering trader is in ignorance of the extent to which he is victimized by his rulers, just because he cannot precisely tell how and where the money goes. We are the more inclined to form this opinion after reading the President's comments upon a proposal for levying a tax upon gasholders, at the rate of 20 centimes per cubic metre capacity, irrespective of the tax payable on the gross value of all plant and utensils, and a separate rate on all mains and pipes which are laid under any public highway. Our own system of valuation for the relief of the poor is frequently oppressive,

but it is at least final and comprehensive, and we are fast becoming strangers to the multitudinous and very shallow devices in taxation with which our Continental neighbours are yet afflicted. A complex organization such as a gas undertaking offers a ready field, in the multiplicity of its belongings, for experiments in that kind of taxation which is akin to the method of raising money known to the impecunious as "kite-flying;" but as long as Governments have to provide for vast expenditures without daring to ask the taxpayer openly for the revenue they require, we must expect to see continued manifestations of this peculiar description of misapplied ingenuity.

The Wolverhampton magistrates have recently had occasion to clear up a doubt which seems to have prevailed in that neighbourhood respecting the liability of carts loaded with refuse gas lime to pay toll on passing over turnpike roads. As it was not disputed that manure of any kind in transit for use in agriculture is exempt, it is difficult to see how such a well-known manure as foul lime could have been considered subject to toll by any one other than an over-officious gate-keeper. An effort was, however, made to show, in defence, that as lime is not always exempted from toll, the particular compound in question lay at least in debatable ground; but this ingenious contention was overruled on the broad common-sense principle that the material was in fact manure, and was only intended for use as such. Therefore the toll-gate keeper will interfere no more with the free transit of farmer's carts as they remove the rejected material of the purifiers of the Wolverhampton Gas-Works.

The Salford Town Council have been charged more than once of late with reckless extravagance in respect of certain proceedings to which they have committed themselves, notably in connection with the enclosure of open spaces, making new roads, and similar works, for which, as alleged, they are burdening the present generation of ratepayers for the prospective benefit of their descendants. So deeply has the sense of their excessive generosity in these matters sunk into the popular mind, if the local press is to be believed, that the next municipal elections will probably turn in favour of a new set of candidates pledged to "economy above all things." The growing discontent has already had some effect on a choice few of the present Councillors, who are apparently anxious to trim their sails to the rising breeze while there is yet time. Hence, the spending departments having drawn on themselves no little public odium, it is only natural Town Councillors logic to turn at once to the sole important source of profit possessed by the Corporation—the gas undertaking—and endeavour to effect a saving somewhere in connection with it. This was done, and in the present instance the chance of making a telling stroke of economy soon presented itself. The Salford works supply gas over a district of forty square miles, much of which is ill-provided with means of conveyance, and it is not surprising that the Engineer, who was expected to exercise personal supervision over this extensive area, demanded, when he first assumed his duties, the convenience of a "horse and trap." This, however, was denied to him; but cabs proving rather costly, the Gas Committee eventually made him an allowance for travelling expenses, leaving him the choice of conveyance. This is the outlay which has shocked the economic sensibilities of a few members of the Town Council. An undertaking returning a profit of over £40,000 per annum by operations conducted over a large area, cannot, it is said, bear an expenditure such as is necessarily incurred by a parish doctor. And the moment chosen for this exhibition of cheese-paring is the same which witnesses a reduction in the price of gas, still leaving a good margin of anticipated increased profit. And the manner in which it is endeavoured to show some appreciation of the services of the man who is officially responsible for keeping the concern on its legs, is to put him on his—by making him walk.

The statistics of the Oldham Corporation Gas-Works, of which we publish some extracts in another column, show a good margin of profit on the past year's working, almost the whole of the disposable balance, or a net sum of £13,500, having been added to the respectable amount previously taken from the gas profits and applied in aid of the rates. Much detailed information of a general character is given in the various accounts and tabular statements appended to the report; but, as in too many compilations of this kind, in a form which fails to give them the interest, as a means of comparison with results obtained elsewhere, which might have been secured with very little extra trouble. If the methods of analysis practised by Mr. Field with respect to the accounts of the Metropolitan Gas Companies, or by Mr. Lass, or even the more exhaustive reduction of groups of

facts into ratios and abstract data, as may be observed in many of the reports of Continental Gas Companies which we publish from time to time, were more generally copied by the accountants who prepare for publication the reports of our important provincial gas-works, a great benefit would be conferred on the members of the profession at large.

It is with surprise that we learn from some of the American papers that Mr. Edison's incandescent lamps, the wonderful carbon horseshoes of which we have heard so much, have actually been improved upon by another inventor—Mr. John H. Guest, of Brooklyn. There appears to be no room for doubt respecting the reality or value of the improvement, which consists in sealing the connecting wires in mercury at the point where they pass into the exhausted interior of the lamp, and so surmounting the difficulty which has troubled Mr. Edison, of air leaking in through cracks in the glass and spoiling the vacuum. This is very satisfactory so far, but how comes it that such a simple expedient was left to an outsider to introduce? This improvement, it is true, is not of such a character as to place the horseshoe lamp at once and for ever on the pinnacle of practical success, to do which, indeed, would require alterations of far greater sweep; but that an improvement, however small, should be possible upon anything emanating from Menlo Park, is another melancholy proof of human imperfection. The lesson is but an old one after all, but it is refreshing to be reminded of its truth, after the repeated efforts of newspaper correspondents and other (dis)interested witnesses to demonstrate that it did not apply to the case of the great inventor.

According to Mr. J. S. Sloane, M.I.C.E.I., late Engineer to the Commissioners of Irish Lights, the introduction of gas for the use of lighthouses is seriously hampered by the great disadvantage that the lenses designed for the old oil-lamp flames, which are also used for gas-flames, are not adapted for securing the best effects which the latter are capable of producing. It may well have been imagined that when the authorities who are charged with lighting our coast line decided to burn gas at some of their most important stations, they would have taken care to supplement the special burners constructed for that purpose with suitable lenses, in order that no part of the available illuminating power should be misdirected or lost; but it appears that this was not done, and, as a consequence, Mr. Sloane is of opinion that gas has not in this connection received full justice. No one, however, will be surprised to hear from the same authority that the electric light, when tried for lighthouse purposes, has had every encouragement that science and art can give to make it practically successful, although, after all, Mr. Sloane has only qualified praise to give to it. On the different grounds of reliability, clearness in foggy weather, steadiness, and economy, he contends that gas is infinitely preferable to the electric light for lighthouses, even with the unequal conditions under which the two systems have hitherto existed, while expressing himself as unable to imagine what would be the effect of the largest and most perfect gas-burners, if fitted with properly-prepared lenses. That such observations as these should be possible is anything but creditable to the authorities in question; and we may be absolved from the charge of contending for the interests of gas alone in expressing the hope that in all cases, whatever luminant may be employed in lighthouses, suitable apparatus for enabling the light to do its duty to the full may not be lacking. Mr. Sloane has described the principle on which he would construct lenses for gas-flames, and the feasibility of making appliances of this kind to meet any requirements is not disputed; so that, now the evil which has arisen from a perhaps inadvertent application of defective lenses to Mr. Wigham's burners has been publicly exposed, we may expect to see it remedied.

Ever since the development of the various manufacturing processes involved in the production of wrought iron, which resulted in the application of that material to the multitudinous uses with which it has been associated in modern times, efforts have been constantly made to remove one of the greatest practical drawbacks to its continuance in strength, utility, and beauty—namely, its tendency to rust. It is too well known that wrought iron is no sooner turned out of the manufacturer's hands than it begins to decay from this cause, and nothing hitherto discovered, by way of preventive treatment, during manufacture or after, has availed to thoroughly preserve it in its pristine state. Galvanizing with zinc has for long been a favourite device for protecting a certain class of wrought-iron goods; but its capabilities are limited, it is costly, and not always desirable. Platinizing has also been warmly advocated as far preferable to galvanizing for the same class of articles. And now the latest

device, although one not particularly novel in principle, is that of coating iron with a film of its own magnetic oxide, which has been brought under general notice by Professor Barff and Mr. George Bower, of St. Neots. Although the same end is arrived at by the two systems followed by Professor Barff and Mr. Bower respectively, the means adopted in each are quite different. Barff's may be described in brief as a steam process, the oxidizing agent employed to produce the peculiar action before mentioned on the surface of the iron being superheated steam; while Bower's process consists in subjecting the iron to be coated to carbonic oxide flame, with an excess of hot air. In both cases the result is the formation of a thin film of magnetic oxide of iron, adherent to the wrought-iron articles subjected to treatment, and this film is not susceptible of deterioration or further change in presence of influences which would speedily destroy ordinary metallic iron. With the relative advantages of the two processes named we need not at present concern ourselves, for if the principle eventually meets with extended success, the survival of the fittest will be observed in this as in every other contest, and the system which is most reliable and the cheapest will be most successful. We may, however, state a few considerations on the general subject. In the first place, it will be observed that, as with galvanizing, there exists a great class of subjects to which the oxidizing process will not apply. Nothing, in short, that cannot be put into an oven can be treated by either a steam or a dry method of oxidation. The plates and bars for large iron structures may, indeed, be so treated, whenever there is no subsequent manipulation—such as hammering, welding, riveting, and the like—to be gone through. When any rough usage of this kind is necessary, no method of previous surface treatment will avert rusting. Hence for gasholders, &c., it is to be feared that the paint-brush must still remain the grand preserver. But, of course, there is an enormous scope for the peroxide process, even if the bulkier subjects are excluded from its range, and in its proper field it may be found to yield results equal to the highest expectations of its friends.

Water and Sanitary Notes.

THE Select Committee on London Water Supply are to meet to-day to consider their report. Probably the document will not be finally settled until Friday, but it is not likely that there will be any delay beyond that period. The report itself can deal with only one phase of the question—namely, the provisional agreements. The evidence of witnesses and the speeches of counsel have been limited to that particular part of the inquiry, and only in this way have the Committee succeeded in getting to a stage at which they can present a report. It cannot be said that the Committee have fulfilled the terms of the reference made to them by the House, and the fact that they have not done so is mainly due to the mode of proceeding which has been marked out by their Chairman, Sir W. Harcourt. We are rather surprised to find the Chairman trying at the last to throw the responsibility of the defective evidence upon the parties who came before him. As a matter of fact, the inquiry has been limited to the examination of four witnesses—that is to say, Mr. E. J. Smith, Mr. Allen Stoneham, Lieut.-Col. Bolton, and Mr. Richardson. When Mr. Philbrick announced his intention of calling the last-named gentleman, who is Chairman of the Parliamentary Committee of the Metropolitan Board of Works, Sir W. Harcourt observed: "I hope, for the present, you will confine yourself to the question of the agreements. Any other question we may consider hereafter." Nevertheless, we find Sir William saying to Mr. Philbrick on Friday last: "I left it to you to exercise a discretion such as the Corporation of London exercised. It is entirely for you. It is not for this Committee to exclude evidence that you are prepared to press." The Chairman further observed: "I understood distinctly from Sir James McGarel Hogg that the Metropolitan Board of Works had considered the matter, and that they did not propose to offer further evidence; but if they take a different view now, it will, of course, launch us into a very large inquiry." It is to be hoped the fact will not be lost sight of, that, if the subject had been fully investigated, there would have been this "very large inquiry." Whether it is possible to decide on the question of purchase without considering the practicability of an alternative scheme, is a point which may very well be raised. All we can expect from the Committee is a kind of negative result, declaring that the provisional agreements are not such as they can recommend for the approval of Parliament. In one aspect there may be something gained,

inasmuch as the provisional agreements will be swept out of the way, and there will be a *tabula rasa* on which to inscribe a new story. Sir W. Harcourt, we doubt not, will be glad of this clearance. Sir Richard Cross's bargains were not to his mind. They were things to be got rid of, and after what we must designate as a very limited inquiry, the scheme of the late Government is evidently destined to be rejected. Sir W. Harcourt was right in one respect. He pointed out that the last part of the reference to the Committee had relation to the nature and extent of the powers of the Water Companies to levy water rates and rents. "Now, that part of the reference to the Committee," said Sir William, "was drawn up specially with regard to a memorial presented by the Corporation of London, praying 'that the basis of charge' should be inquired into." Despite the presentation of this memorial, the "basis of charge" was entirely ignored by the Corporation in the case which they presented before the Committee. Mr. Richardson adverted to it on behalf of the Metropolitan Board, and that was all. The omission on the part of the Corporation affords another instance, in addition to many of a like nature, in which complaints are made but never substantiated.

Mr. Richardson, in his evidence on Tuesday last, endeavoured to show that the ultimate cost to the Water Trust, for the purchase of the undertakings according to the provisional agreements, would be nearly £40,000,000. The demonstration respecting these figures was somewhat long and complicated, as might be expected, seeing that the immediate stock bearing three and a half per cent. was to be £22,098,700, and the deferred stock £9,280,000. The present value of the deferred stock has been reckoned at something over £7,000,000, so that the total stock could only be estimated at a sum falling short of £30,000,000. No ingenuity can make the amount greater, except by extravagant assumptions. In the course of his cross-examination by Sir Edmund Beckett, Mr. Richardson acknowledged that it would be "fair" to give the Companies twenty-five years purchase of their last year's dividends, with ten per cent. added for compulsory sale. The witness was then reminded that Mr. Stoneham showed the net income of the Companies for 1879 to be £740,000. Assuming the purchase on the terms proposed by Mr. Richardson, the amount to be paid would be £20,350,000. Mr. Richardson further allowed that this should be paid "in money." He "did not think" there would be any difficulty "in making a money payment." By his own mode of calculation, Mr. Richardson brought out the value as £20,430,261. If, instead of a payment in money, as contemplated by this gentleman, we make our reckoning on the basis of three and a half per cent. water stock, it will be seen that £740,000 a year represents stock to the amount of £21,140,000. But when we come to the question of prospective profits, we find where it is that Mr. Richardson diverges so widely from the provisional agreements. He would not allow anything for future profits. Mr. Richardson was evidently surprised to find that in regard to the current income of the Companies, he was approaching so near to the figures adopted by Mr. Smith. "But," said Mr. Richardson, "we give no increment." "Then," said Sir E. Beckett, "the only difference between you and Mr. Smith is as to the increments, and you think there ought to be no 'increment'?" "I think increment is a most uncertain 'thing,'" said the witness. Yet Mr. Richardson believed that if the Metropolitan Board had the opportunity given them, they would be able to come to terms with the Water Companies, so as to purchase their undertakings. It is certain, however, that the Companies could not be expected to forego their prospective profits, and on this point we do not see how the terms could be agreed upon, unless the Metropolitan Board took a somewhat different view of the case from that expressed by Mr. Richardson.

The exaggerated and sensational comments of the public press on the terms of the provisional agreements were pungently referred to by Sir E. Beckett in his speech to the Committee. We may say that the press has not done its duty on the subject. The journalist ought not to consider himself merely as an advocate for the consumer or the ratepayer, but rather as occupying a *quasi-judicial* position between the public and the Companies. Superficial, *ad captivandum* statements, on a grave public question, are beneath the dignity of true journalism. Throughout the whole discussion in the editorial columns of the press, there has been a strange disregard of the fact that the purchase of the London Water Companies works, according to the scheme of Sir R. Cross, was to be effected by "stock," and not by cash. How materially this affects the question is readily to be seen. The public are told that the Companies have only expended £12,000,000. But we

see that this already gives them more than six per cent. on an average, including preference shares, loans, and debentures. If, for facility of illustration, we take the average return at seven per cent., we should like certain critics to try and estimate what difference there may be between £12,000,000 at seven per cent., and £24,000,000 at three and a half per cent. Yet when a transfer of this kind is proposed, an outcry is raised that the Companies are to receive twice what they have expended. An allowance having been made for prospective profits, thereby bringing up the proposed water stock to a present value of nearly £30,000,000, it has been alleged that the Companies were to receive nearly three times the amount of their capital. All this has answered a purpose, and a mischievous one. It has prejudiced the public against an arrangement which, if carried out, would have been beneficial to the consumers, although doubtless favourable also to the Shareholders in the Companies. Sir E. Beckett put the case fairly, when he said: "The real nature of this bargain is that 'the Companies are guaranteed their present income for all 'time to come, and they are guaranteed their probable 'increase of income, that probable increase of income for 'the future being derived from the experience of the past.' Whatever may be thought of this arrangement by the outside world, the Companies are quite content to have it cancelled, providing they are let alone for the future. They are not seeking to have the agreements carried out, but are acting purely on the defensive. To them the provisional bargains present no very tempting prospect, whatever others may think of them."

The proposal to estimate the income of the Companies on an average of past years is a transparent fallacy, but is one of the methods adopted to depreciate the true value of the property. If the past income were higher than the present, we should hear a different doctrine propounded. In like manner it is unjust to exclude the fact that where the maximum dividends have not been reached, the Companies are evidently advancing towards that goal. An income that has risen and is continuing to rise must represent something more than the value which corresponds to a falling or stationary income. Sir W. Harcourt's favourite mode of examination, by which he elicited answers showing how many years purchase was to be obtained by the Water Companies under Mr. Smith's agreements, was effectually dealt with in the speech of Sir E. Beckett. The amount of stock to be given in purchase of the undertakings depended on the rate per cent. It was, therefore, absurd to take the amount of stock as showing the number of years purchase. The actual cost to the purchaser would remain the same whether £11,000,000 were paid in 7 per cent. stock, or £22,000,000 in 3½ per cent. stock. Yet in the latter case the number of years purchase, according to the popular reckoning, would be double the number in the former case. Using this argument, Sir E. Beckett went on to say: "Therefore I wish the public to 'understand that all the talk there has been, all the 'speeches that have been made, all the articles in news- 'papers that have been written, about giving some enormous 'number of years purchase, are entirely nonsense; they mean 'nothing; they are merely talk about arbitrary figures.' "In fact," said Sir Edmund, "every word that has been said 'in this room, and out of this room, about the number of 'years purchase to be given for the present value, has 'nothing upon earth to do with the subject.'"

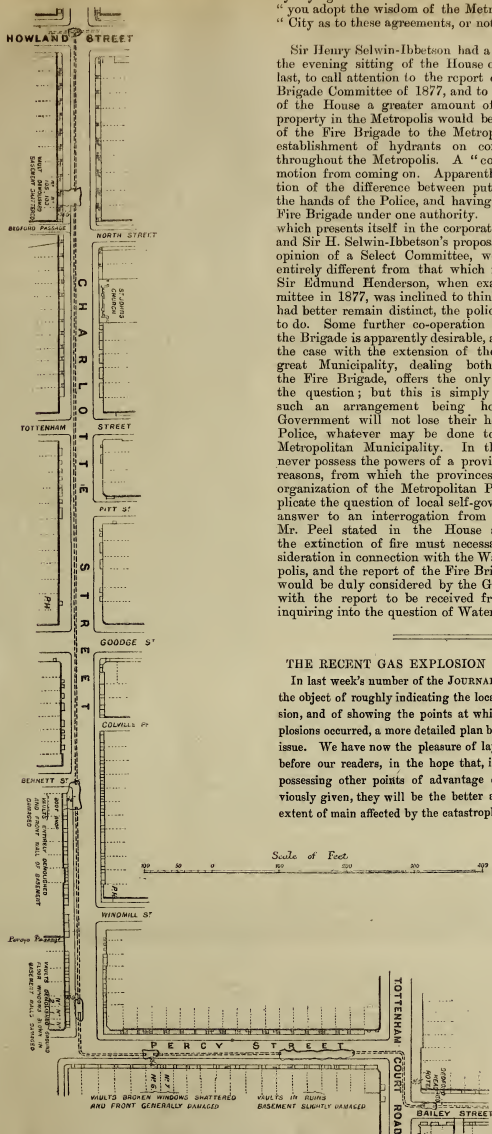
If an able address from a learned Counsel could have weight with a Select Committee, so as to overcome a strong adverse impression, we might surely hope that the speech of Sir E. Beckett would avail to produce a report more or less favourable to the terms agreed upon by Sir R. Cross. The speech can hardly fail to produce some effect; but while we give the Committee full credit for seeking to get at the truth, it is to be feared that the popular view, so assiduously and vigorously promulgated prior to the opening of this inquiry, will prevail in the preparation of the report. The opposition of the Metropolitan Board and the City authorities to the terms negotiated by Mr. Smith will necessarily influence the decision, and the result is too likely to be of the nature we have already intimated. As to the next step, Sir E. Beckett signified that the evidence given on this inquiry had shown the Companies more clearly than ever what "an extremely 'good bargain' they had offered to the Government. In the future, said Sir E. Beckett, the Companies would be careful not to bind themselves and leave their opponents free. Supposing an arbitration to be enforced, "we may do as they did at 'Birmingham,'" said Sir Edmund; "we may compromise the 'arbitration rather than try it out.' But all was uncertain, and the learned Counsel for the Water Companies concluded

by saying to the Committee: "I leave you to judge whether you adopt the wisdom of the Metropolitan Board and the City as to these agreements, or not."

Sir Henry Selwin-Ibbetson had a notice on the paper for the evening sitting of the House of Commons on Tuesday last, to call attention to the report of the Metropolitan Fire Brigade Committee of 1877, and to move that in the opinion of the House a greater amount of protection to life and property in the Metropolis would be attained by the transfer of the Fire Brigade to the Metropolitan Police, and by the establishment of hydrants on constantly charged mains throughout the Metropolis. A "count out" prevented the motion from coming on. Apparently there is little appreciation of the difference between putting the Fire Brigade in the hands of the Police, and having both the Police and the Fire Brigade under one authority. The latter is the example which presents itself in the corporate towns of the provinces, and Sir H. Selwin-Ibbetson's proposal, though backed by the opinion of a Select Committee, would produce something entirely different from that which it is supposed to imitate. Sir Edmund Henderson, when examined before the Committee in 1877, was inclined to think that the Fire Brigade had better remain distinct, the police already having enough to do. Some further co-operation between the Police and the Brigade is apparently desirable, and this will be especially the case with the extension of the hydrant system. One great Municipality, dealing both with the Police and the Fire Brigade, offers the only effectual settlement of the question; but this is simply theory, the prospect of such an arrangement being hopelessly remote. The Government will not lose their hold on the Metropolitan Police, whatever may be done towards creating a great Metropolitan Municipality. In this respect London will never possess the powers of a provincial borough. Political reasons, from which the provinces are exempt, affect the organization of the Metropolitan Police, and serve to complicate the question of local self-government in London. In answer to an interrogation from Sir H. Selwin-Ibbetson, Mr. Peel stated in the House a few nights ago, that the extinction of fire must necessarily be a primary consideration in connection with the Water Supply of the Metropolis, and the report of the Fire Brigade Committee of 1877 would be duly considered by the Government in connection with the report to be received from the Committee now inquiring into the question of Water Supply.

THE RECENT GAS EXPLOSION IN THE METROPOLIS.

In last week's number of the JOURNAL we gave a small map with the object of roughly indicating the locality of the recent gas explosion, and of showing the points at which the several successive explosions occurred, a more detailed plan being promised in the present issue. We have now the pleasure of laying the accompanying plan before our readers, in the hope that, it being drawn to scale, and possessing other points of advantage over the rough sketch previously given, they will be the better able to form an idea of the extent of main affected by the catastrophe.



PLAN SHOWING POINTS AT WHICH GAS EXPLOSION OCCURRED, JULY 5, 1880, IN PERCY STREET AND CHARLOTTE STREET.

THOMAS WILLS: A MEMOIR.*

In the month of May last year we recorded the death of Mr. Thomas Wills, who, although not 29 years of age when he died, was already widely known as a chemist and lecturer of great promise. In connection with the science of gas-making especially, much was expected from his future; for to it, as to each of the pursuits in which he was interested, he devoted himself with rare intelligence and unflinching energy. The lectures which he delivered before the Manchester District Institution of Gas Engineers in 1872 and the British Association of Gas Managers in 1878—the one on “Residual Sulphur in Gas,” and the other on “The Products of Combustion”—displayed not only a complete acquaintance with his themes so far as they had been then investigated, but they also contained largely the thoughtful suggestions of an original observer.

As Secretary to the Chemical Section of the Society of Arts, a position which he held from the formation of that section until his death, he succeeded in obtaining from year to year a succession of admirable papers, and in maintaining its usefulness and interest to the full satisfaction of the Council and members. He was also one of a Committee of three appointed by the British Association for the Advancement of Science to inquire into and report upon the best means of developing the illuminating power of coal gas; and would, had he lived, have prepared the second part of the report, which should have been presented at last autumn's meeting of the Association. Immediately before his death Mr. Wills was conducting experiments upon the relative values of gas and electricity for purposes of illumination, and in the course of these experiments he observed that nitric acid was formed by the burning of the electric light, and communicated the fact to the Chemical Society. Professor Tyndall referred to this discovery in his evidence before the House of Commons Committee last session on Electric Lighting, and Mr. Wills was gratified upon his death-bed by hearing that the Professor had named him in connection with it.

Ambitious without apparently a trace of vanity or self-seeking—ambitious rather to do useful work for the sake of the truth it might teach, or the good it might do, than for any praise or advantage it might bring to him—Mr. Wills never spared himself. The writer and others warned him in the winter of 1878 that he should limit his labours, and he promised to do so when he had fulfilled the engagements he had made. Before, however, this was done he was prostrated by fever, from which he did not strength to rally.

The little book which loving hands have compiled will be read with interest by all those who knew the late Mr. Wills, and it will be welcome also to those who value the history of a good life, told, as in this case, with a touching enthusiasm. The volume contains abstracts of several of the papers written, and lectures delivered by Mr. Wills, and, in an appendix, a very full report of his three lectures on “Explosions in Coal Mines,” delivered before the Society of Arts, and for which he received the Society's medal. It is also embellished with an admirable portrait.

Communicated Article.

EXPLOSIVE MIXTURES OF COAL GAS AND AIR.

By Mr. W. FOSTER, M.A., &c.,

Professor of Chemistry at the Middlesex Hospital.

The disastrous events which have recently occurred through the ignition of explosive mixtures of coal gas and air have excited a considerable amount of attention, and have given rise to much unnecessary anxiety. As an abstract proposition, the dangerous nature of a mixture of coal gas and air is generally understood not only by those engaged in the manufacture and distribution of gas, but also by a large section of the educated public. The best practical method of dealing with such mixtures and of preventing their formation is, however, a matter on which much misconception exists; and this chiefly arises from an insufficient appreciation of the general properties of gaseous bodies. A knowledge of the practical bearing of the laws of the diffusion of gases is not by any means so general as one could wish. The present, therefore, appears a fitting occasion for a few observations on a subject of the greatest importance to all concerned in the manufacture and use of coal gas. It may appear an idle statement to say that coal gas, in a confined vessel, is perfectly harmless; but unfortunately one is continually meeting with persons in all grades of society who do not share such a simple opinion. It therefore often becomes a part of the gas manager's duty to instruct his customers with reference to the properties of the article he manufactures.

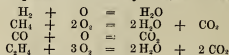
Coal gas, whether cannel or common, is a mixture of several gases with the vapours of hydrocarbons of low boiling point. By far the greater portion of any given volume of common gas consists of hydrogen and marsh gas (CH_4), the sum total of these two components varying from 80 to 90 per cent. of the whole. In 1851, Dr. Frankland made an analysis of the common gas supplied by the Chartered Gas Company in London, and in 1876 the same Company's common gas was analyzed by Mr. Humphidge. The results of these two analyses, so far as the chief components are concerned, are given in the following table:—

	1851.	1876.
Hydrogen	51·8	50·5
Marsh gas (CH_4)	35·2	38·3
Carbonic oxide (CO)	8·9	3·1
Heavy hydrocarbons expressed in their equivalents of olefiant gas (C_2H_4)	7·7	7·8

* “The Life of Thomas Wills, F.C.S., Demonstrator of Chemistry, Royal Naval College, Greenwich.” By his Mother, Mary Wills Phillips, and her Friend, J. Luke. London: J. Nisbet and Co. 1880.

Now each of these components when allowed to escape from a containing vessel into the external atmosphere can be ignited and consumed like any other combustible material. The oxygen of the external air is necessary to carry on the chemical action which is commenced by the application of the ignited substance; and, in the case of the gases containing carbon, further provision is necessary for the removal of the carbonic acid gas produced. The high temperature required to start the combustion of the gas is maintained by the chemical combination of the latter with oxygen. Coal gas does not differ in these points from its individual components. For its ignition the heated body must have a temperature of a certain quality—a circumstance quite apart from the total amount of heat which it may possess. The smallest spark of butane is sufficient to ignite a jet of coal gas escaping in atmospheric air. An excellent illustration of this phenomenon is afforded by the use of the electric spark. If a person insulate himself from the earth by standing on a stool having glass legs, or on a couple of glazed earthenware jars, and whilst in this condition place his hand on the conductor of an electrical machine, sparks may be taken from his body during the time the machine is put in motion by a second individual. If a jet of coal gas be allowed to escape from a metallic burner within his reach, on his extending his other hand, and causing one of his fingers to approach the burner from above, a spark will at length pass to the burner, producing ignition of the gas. [It will be remembered that this principle was advocated on a limited scale a few years ago when there was a prospect of a tax being imposed on lucifer matches. The apparatus was ingenious but cumbrous.] In this experiment the particles of gas in the track of the spark are rendered brightly incandescent; and although their mass must be extremely small, yet they are capable of setting up a similar condition throughout the whole gas-jet. On the other hand, comparatively large masses of solids at lower temperatures are incapable of setting up a similar condition of things. For instance, a coal cinder at a dull red heat, and devoid of flame, will not cause ignition of a jet of coal gas, neither will the dull red embers of a recently extinguished deal wood match. It is clearly obvious, therefore, that heat as a quantity is not essential to the commencement of the phenomenon of ignition. The substance, whether solid or gaseous, must possess those qualities which enable it to emit light radiations of a certain order—those which are particularly abundant at the more refrangible end of the spectrum produced by a source of white light.

If the composition of a sample of coal gas be required, the amount of oxygen (and therefore of atmospheric air) required to effect its perfect combustion is a matter of simple calculation. Let us consider the case afforded us by Dr. Frankland's analysis. As every two volumes of hydrogen require one volume of oxygen, the 51·8 volumes of hydrogen given in the analysis require 25·9 of oxygen. Every two volumes of marsh gas require four volumes of oxygen, and therefore 31·5 would require 63·0. Therefore two volumes of carbonic oxide require one of oxygen, and therefore 8·9 require 4·4. Every two volumes of olefiant gas require six of oxygen, and therefore 7·7 require 23·1. The results of these four independent oxidations are expressed in chemical symbols, as follows:—



On adding together these several quantities of oxygen, we find that 100 volumes of such common gas require 116·4 volumes of oxygen for their complete combustion. As every five volumes of air contain one of oxygen, it follows that the quantity of atmospheric air necessary to completely effect a like result is 582 volumes. In other words, one volume of gas of the quality under consideration requires nearly 6 volumes of air (5·8). I need hardly say that, in practice, larger volumes of air are necessary to carry on the ordinary process of combustion in an efficient manner, the surplus air assisting very materially in removing the products of oxidation from the points where they are produced. When atmospheric air is mixed with coal gas in the proportion of about 23 volumes of the former to 1 of the latter, the mixture can be ignited when issuing from an ordinary burner, and consumed in the same way as the undiluted coal gas. The character of the flame, however, differs from that produced by the pure coal gas in that it loses, in a very marked degree, its light-giving properties. This phenomenon has given rise to much experiment, and is the result of several influences operating somewhat differently. Their consideration is outside our present question. In the case of a mixture having the proportions I have just named, it is obvious that a considerable proportion of oxygen is required for the complete combustion of the gas. This additional quantity is derived from the external air, as in ordinary cases. If we take a mixture of gas and air in the proportions needed for the complete combustion of the gas (and, in the case of the particular quality we have already considered, we shall require 6 of air to 1 of gas), such a mixture can be burnt under special circumstances, and is, theoretically, quite independent of any supply of oxygen from external sources. Such a mixture is explosive. Suppose, for instance, that a cubic foot of it be confined in a spherical vessel, and that a flame be applied to a portion of the gaseous mass; rapid combustion of the mixture would immediately follow with explosive violence. As it contains in its own substance the oxygen required to form the ultimate oxidation products, and as these are gaseous, and produced at an excessively high temperature, in a very short interval of time, the pressure which they exert on the sides of the containing vessel is very great. One speaks in general terms of such an explosion as being instantaneous. Such, however, is

not absolutely the case. A certain definite interval is needed for the completion of the action which has been commenced by the application of the lighted substance. In other words, the flame applied to the explosive mixture traverses its substance with a certain velocity. The proportion of gas and air now considered are those which we have deduced from the analysis. In practice, however, where explosive mixtures are needed, as in the modern gas-engines, a larger proportion of air is required to yield the maximum explosive force, and in the case of ordinary common gas about 1 volume to 8 volumes of air furnishes the best results. We will consider the behaviour of mixtures of gas and air in varying proportions subsequently. Let us for the present confine our attention to the behaviour of a cubic foot of an explosive mixture when ignited in vessels of the same capacity but of different shapes. I have selected a spherical vessel as the starting point in our discussion, because it is symmetrical. When filled with an explosive mixture and fired, there is a greater pressure on each unit of area of surface than in any other vessel of the same capacity, because a less interval of time is necessary for the passage of the flame to every portion of the explosive mass. In order to realize the velocity of the passage of the flame through the explosive mixture, we must alter the shape of the containing vessel. A cylinder is the best adapted for our purpose. A cylinder a yard long and about 8 inches in diameter would have a cubical capacity of one foot, and when filled with the explosive mixture and fired at one end would not produce such a very marked effect as in the former case. A tube 2 inches in diameter would require to be about 16 yards long, and if filled with the explosive mixture and fired at one end as before, we should be able to distinctly realize the interval required for the passage of the flame from one end of the tube to the other. The explosive action would also be very considerably diminished. If we now take a tube having a diameter of half an inch, it would require to be 256 yards in length in order to have a capacity of one cubic foot, and if we were to take any convenient length of such a tube made of glass, and fill it with the explosive mixture, on igniting it at one end we should observe that the flame would pass down the tube without giving rise to any explosive action, and at such a rate as to admit of its velocity being measured. There are two important influences tending to bring about this modification of the result. Firstly, but a small quantity of the explosive mixture is consumed in a short interval of time; and, secondly, there is the cooling effect of the sides of the tube on the gaseous products of combustion. Their temperature is never so high as when produced in larger masses, because the cooling action of the sides of a cylinder is greater in proportion to its diminished diameter. This is easily shown by the following considerations. Taking the ratio of the circumference of a circle to its diameter as 3 (this has been done in former calculations), our first cylinder—namely, that having a length of 36 inches and a diameter of 8 inches—gives 24×36 or 864 square inches as the area of its containing sides. In the last case where the $\frac{1}{2}$ -inch pipe must have a length of 256 yards in order to furnish the same cubical capacity, we find that the area of its containing sides is

$$3 \times 5 \times 256 \times 36, \text{ or } 13,824 \text{ square inches.}$$

The area of the sides of this $\frac{1}{2}$ -inch pipe is therefore 16 times greater than that of the shorter cylinder, and consequently every cubic inch of the explosive mixture consumed in the $\frac{1}{2}$ -inch pipe is exposed to an area of cooling surface 16 times greater than that which obtains in the other. By diminishing the diameter of the pipe still further, we should at length arrive at such a condition of things that the cooling influence of the sides would prevent the transmission of flame by the explosive mixture. The circumstances would then be such that the temperature of ignition of the explosive mixture could not be maintained by its own combustion.

We have assumed in these imaginary experiments with cylindrical vessels that the pressure of the explosive mixture in their interior is equal to that of the atmosphere, and in so doing have only partially considered the case. When the pressure is greater than that of the atmosphere, we bring a new feature into the discussion. Its bearing on recent events is most important.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

MR. METHVEN'S TEST FOR ILLUMINATING POWER.

SIR,—I have read and re-read several times the letter of Mr. W. Lyon, which appeared in your issue of this day (July 13), and have only succeeded in realizing that he has an eccentric notion as to what a "Methven's test" is, and an equally eccentric notion as to the manner in which the illuminating power of gas may be determined.

Taking the left-hand column of his table as indicative of the rate of consumption with the screened burner (representative of Methven's), I find such rates to vary from 2.742 to 4.551 cubic feet per hour. What does this mean? Does Mr. Lyon mean that a 3-inch flame was in each experiment obtained, with such extreme differences in the rates of consumption? If not, what then? Did he work with various lengths of flame? for if he did the latter thing, I say, for the first time, that his results are worthless.

Again, I find that with the opposed Argand the rates of consumption varied from 4.014 to 6.074 cubic feet per hour, and that in the last column the illuminating power for 5 cubic feet has been calculated up and down from such extremely divergent rates. For the second time I say his results are worthless, inasmuch as the light given by a flame produced by the combustion of gas at the 5-cubic feet rate, cannot be deduced, with any near approach to accuracy, from results obtained with consumptions varying more than 2 or 3 per cent. from the standard rate.

So much for the "table." Next as to the "test" light which Mr. Lyon has so carefully described in the following words, and thereby made manifest that he did not operate with Methven's test at all, but with some crude conception of his own. "These are his words: 'On each end of the rail is fixed one of Sugg's 15-hole 16-candle Argand burners, with a 7-inch by 2-inch chimney. The centre of the slit (or slit, the size of which Mr. Lyon does not state) fixed on my left hand is 2 inches above the perforated face of the Argand, and 14 inches from the side of the chimney.' These few words show that Mr. Lyon is wrong as to the burner, wrong as to the position of the slit, wrong in the length of chimney, wrong in the distance between the burner and the slit, besides being (as already shown) wrong in his method of estimating illuminating power. His letter is unique, for surely never before were so many errors included in one brief epistle.

Mr. Lyon has made a screen and applied a burner in ignorance the while of what constitutes a true "Methven's test." Verily the said "test" is not at all likely to be condemned any more than candles are likely to be upheld by such testimony as Mr. Lyon has given. In due time he perhaps may become converted, like myself, and then be an advocate for "Methven's test." I now advise him to re-study the subject, and make new experiments in a manner more consistent with the requirements of accuracy than marks those which he has made.

I have kept this letter as brief as I could, and so I deem it needful to say that if any expression herein seems contradictory to the statements which I made in my paper read before, and in my reply to speakers at the recent meeting of the British Association of Gas Managers, I am prepared to prove my consistency.

55, Millbank Street, S.W., July 13, 1880.

F. W. HARTLEY.

MR. HARTLEY'S CRITIQUE OF MR. NIVEN'S PAPER ON CORRECTIONS FOR TEMPERATURE AND PRESSURE.

SIR,—I observe in your last number the final letter of Mr. Hartley regarding my paper. We are under a debt of gratitude to him, for his letters are not only most courteous, but replete with information. I find he has a keen blade in the fight. I frankly and freely admit that he has caught me napping when I (*lapsus penne*) wrote t^{60} , which, as he says, "means that the gas is 60th power; and, if he takes the t^2 way, its 60th power would come to more figures than the printer of the JOURNAL would care to find." This is, indeed, true. But how few would notice the difference between 60th and t^{60} , that is, between a coefficient and an exponent. Of course $t = 60$ is obvious. By the *argumentum ad absurdum* Mr. Hartley says let $t = 2$, and the 60th power is absurd. For the curious, I may state that the number of figures in a row or by notation of the 60th power of 2 would be trillions. Thus, log. $2^{60} = 18.018000$; that is to say, there would be a row of 19 figures. Now, as a row of 7 figures makes a million, the enormous sum may be understood. But suppose $t = 1$, what would t^{60} be? Why only 1, and the printer of the JOURNAL would have no difficulty in printing the figure 1. Mr. Hartley has corrected my mistake.

Now, in closing, I would like to give Mr. Hartley the following complex *argumentum ad hominem*. If, as he says, Mr. Vernon Harcourt, two years ago calculated the new table in accordance with Regnault's coefficient, and took aqueous tension also into account, and that the propriety of the Metropolitan Gas Referees in issuing the new table is beyond question, and that the old table must now be regarded as "obsolete," why will Mr. Hartley not publish his appendix to his "Manual" in a pamphlet form *separately*, not only for ready use, but also as being a common authority to which all can appeal, and by which accurate results can be attained.

I also notice a very long letter from Mr. Lewis T. Wright. As I think that he has either had a month's special preparation to write it, or that, like Rip Van Winkle, he has been napping, I wish you to give me space in your next issue to consider his prelections. I am sure, and brother managers will concur, that in the masterly hands of Mr. Hartley his father's name will never suffer, and, in fact, there is not the least shade for such an imputation.

Dunoon Gas-Works, July 16, 1880.

D. COATS NIVEN.

[We may state, in reference to our correspondent's remarks, that the appendix to the "Gas Analyst's Manual" was published apart from the book itself, in accordance with the announcements made at the time of its issue in the early part of last year.—Ed. J. G. L.]

THE SANITARY INSTITUTE OF GREAT BRITAIN.

SIR,—Re the Sanitary Institute of Great Britain. As a member of the Council I was present at the recent annual meeting, which you refer to in this week's "Water and Sanitary Notes." The reporter was quite right; Mr. Claudy said: "The principle laid down, if it had been neglected at home, had been thoroughly dealt with abroad—in Germany and France, for instance, and therefore their labour had not been thrown away; it had been carried out somewhere."

Lower Sydenham, S.E., July 14, 1880.

MAGNUS OHREN.

LIEGEL'S REGENERATOR FURNACES.

SIR,—Referring to the letter of Herr Kloenne in your issue of yesterday, it will, of course, be necessary to wait for the drawings he has promised before determining what resemblance the Liegel furnace bears to that designed by him.

In the meantime, as the drawing No. 2, to which he refers, represents my own variation of the Liegel furnace, allow me to state that, however it may resemble Herr Kloenne's furnace, it is not a "copy." I have never heard Herr Kloenne's name before, nor seen any furnace designed by him. As the drawing which I exhibited at the recent meeting of the British Association of Gas Managers, as illustrating the furnace erected at these works, was adapted from the full-sized furnace of which I received drawings from Herr Liegel, and which is represented by drawing No. 1. Examples of both these furnaces are now at work at Maidstone and at Peterborough, with very successful results.

It is strange that furnace No. 1 should, according to Herr Kloenne be a copy of one of his furnaces of the "earliest construction," and abandoned by him long ago; while No. 2, which is really a less perfect

furnace, is a copy of his "latest improvement in gas furnaces," although both "do not," so he says, "properly belong to the class of gas generators, but are simply what may be called 'open fires.'" The inconsistency in this statement is very apparent. G. E. STEVENSON.
Gas-Works, Peterborough, July 14, 1880.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JULY 12.

GAS AND WATER ORDERS CONFIRMATION BILL.—This Bill was read the third time, and passed.

Petitions were presented against the Oldham Improvement Bill, from (1) Inhabitants and ratepayers of Ashton-under-Lyne (Henry Brockley and others), and (2) Churchwardens and Overseers of the Poor for the parish of Ashton-under-Lyne.

TUESDAY, JULY 13.

Petitions were presented against the King's Lynn Corporation Bill, from (1) Richard Bagge and another, (2) Norfolk Estuary Company, (3) Fishermen of King's Lynn, (4) Ratepayers of King's Lynn; and against the Oldham Improvement Bill, from the Earl of Stamford and Warrington, and Owners of property in the parish of Ashton-under-Lyne (Samuel Lees and others).

THURSDAY, JULY 15.

The Chairman of the Select Committee on the Wigan Improvement Bill reported that the Committee had not proceeded with the consideration of the Bill, the opposition thereto having been withdrawn.

Petitions were presented against the Liverpool Corporation Water Bill, from (1) Edward Grindley and others, (2) Runcom Improvement Commissioners; and against alterations in the Bill, from Great Western Railway Company.

FRIDAY, JULY 16.

The Hull Lighting Bill, the King's Lynn Corporation Bill, and the Oldham Improvement Bill were referred to a Select Committee, consisting of Mr. Dufferin (Chairman), Lord Selkirk, Lord St. John, Lord Onslow, and Lord Broughborough, to meet on Monday, July 19.

A petition was presented against the Dagenham and District Farmers (Optional) Sewage Utilization Bill, from Commissioners of Sewers for the Levels of Havering, Dagenham, &c.

HOUSE OF COMMONS.

TUESDAY, JULY 13.

The Rathmines and Rathfriland Water Bill (Lords) was referred to a Select Committee, consisting of Sir Wilfrid Lawson (Chairman), Mr. Gore-Langton, Mr. Grenfell, Mr. Codrington, and Sir John Duckworth (Referee); to meet on Tuesday, July 20. [The British Gaslight Company, Limited (Staffordshire Potteries) Bill (Lords) was referred to the same Committee, but was afterwards withdrawn, owing to the *locus standi* of the Corporation of Clayton and consumers of gas in the district, petitioners against the Bill, having been disallowed.]

HOUSE OF COMMONS COMMITTEE.

THURSDAY, JUNE 17.

(Before Mr. Dodds, Chairman; Mr. SCHREIBER, Mr. J. McARTHUR, and Mr. NORTHCOOTE; Sir JOHN DUCKWORTH, Referee.)

MAIDSTONE GAS BILL.

(Continued from page 60.)

Mr. George Wilson Stevenson, examined by Mr. POPE.

I have visited Maidstone for the purpose of examining the Gas Company's works, and consider they ought to have additional land and storage. At the present time they only require a new gasholder, but in the immediate future they must expend money upon increased plant on a new site. I adopt the figures of Mr. West, who is intimately acquainted with the place and the wants of the Company, and I say that the standard price works out to 47 1/2d. I consider 3d. would suffice to raise the illuminating power from 14 to 16 candles. Within the last 10 years 315 Acts and Provisional Orders have been passed by Parliament, and of these 251 have a prescribed standard of 14 candles, 5 have less than, and 69 more than 14; but about a dozen of the latter class are in Scotland, where ordinary coal is not used. The amount of capital asked for appears to be reasonable, but there is no inducement to the Company to expend capital, when they are obliged to offer it to the highest bidder at a public auction. The only limit should be that they should not be able to go on too long without again coming under the revision of Parliament. I think there should be a differential rate between the borough and the outlying districts, because of the extra cost of distribution. No single instance has a Provisional Order contained any other stipulation as to purity than freedom from sulphuretted hydrogen. Last year there were only two Acts passed in which a limitation was placed upon the sulphur compounds—viz., the Newcastle and Gateshead and the South Shields—20 grains being inserted as the maximum. In the previous year there was only one instance—Shrewsbury—where 20 grains was inserted; and in 1876, again, only one instance—Norwich—where the limit was 30 grains.

By the COMMITTEE: There are no instances in 1877. In the cases of Cheltenham in 1872 and Bath in 1875, the amount of sulphur other than sulphuretted hydrogen is limited to 30 grains, and there is also a limitation as to 5 grains of ammonia in each case.

Cross-examined by Mr. KINGSFORD: The Maidstone Company require an addition of four or five acres to their land. In making this statement I have not regarded the limits particularly, but refer to the increased demand upon the Company, irrespective of the extension of districts. I agree with the last witness that the necessary gasholder capacity should be equal to about a million cubic feet, and considering the size of this undertaking I should put down the next gasholder for half a million feet capacity, which I think would be a wise, prudent, and economical expenditure. Several of the Provisional Orders prescribing more than 14 candles illuminating power have reference to towns in Lancashire—Ashton-under-Lyne, and places of that kind—which are close to the canal coal-fields. The majority have been granted in the last six years.

A MEMBER of the COMMITTEE: Therefore there is a growing tendency to insist upon a higher limit?

Witness: There is.

Cross-examination resumed: The burners in use at present certainly do not diminish the illuminating power of gas, as the old burners used to do. An old brass burner was formerly employed for testing, which required to be supplied with gas under very considerable pressure, in order to obtain 5 feet per hour from it. The gas had not time to mix the oxygen in the atmosphere, and a very large portion of the flame was blue, and therefore

gave no light. Subsequently an improved burner, called the Lethley burner, was invented, which improved the illuminating power about two candles. By section 53 of the Act of 1858, the burner prescribed was an Argand burner with 15 holes and a 7-inch chimney, but at present the Company are using Sugg's No. 1 "London" Argand, with 30 holes.

Mr. KINGSFORD: What difference in candles would this standard burner give? The burner prescribed by the Company's Act can be made to give an illuminating power nearly, if not quite equal to the No. 1 "London" burner, which is used by the Gas Referees in London, and is included in the present Bill.

Cross-examination continued: With regard to the place and time of testing, I do not think it is of any consequence that notice should be given; indeed, I think the Act of 1871, which it is proposed should be incorporated, provides for testing without notice. There is a provision in the Bill for two hours notice, but in the interest of the Company I say that they must be given. The ill-effects of the power companies are managed very quickly at a testing-station, providing all arrangements were made to do it, and there was an intention to deceive.

A MEMBER of the COMMITTEE: Supposing the intention, what time would be required to give effect to it?

Witness: Not more than an hour. Suppose a special main were laid on from the works to the testing-place, and a special small gasholder employed for receiving the improved quality of gas, that improved quality could be made and sent to the testing-place within an hour.

Cross-examination resumed: The quality of the gas flowing through many mains would not be changed in a place like Maidstone, which is too big for the operation. I knew it to be done in the future, when many years ago, when the consumption was not more than half what it is now.

By the COMMITTEE: At the close of the present year the Company ought to begin making extensions for the future. They would have to erect new purifiers immediately if the proposed sulphur clause is forced upon them.

Mr. Alfred Penny, examined by Mr. POPE.

I have visited Maidstone, examined the gas-works, and gone over the district to be supplied. An additional gasholder is required, but there is no space for it on the land now occupied. The owner of the 7 1/2 acres which have been provisionally bought will not part with a portion of it; the whole must be taken, or none. The Company have therefore acquired the whole, simply because they cannot obtain what might have been sufficient. I think, however, that the acquisition of this land is what they must be fairly entitled to make, otherwise they will be obliged to require more land they will have to pay an enormous price for it, and the greater the price the worse for the consumers. Taking all the figures which the Committee have had before them, I think 4s. per 1000 feet would be a proper standard. With regard to purity, I am aware that if a company are compelled to reduce their sulphur compounds to anything like 20 grains per 100 feet of gas, it entails a very large cost, although I do not say it is impossible to be done. The real principle appears to be that the gas must be passed through the purifiers at a very slow sluggish rate before those compounds can be eliminated, and this compels gas companies to double or treble the size of the purifiers which in the old days were considered sufficient.

By the COMMITTEE: If I were the Engineer of the Maidstone Gas Company, I should consider it necessary to provide nearly the same amount of apparatus for 25 grains that I should for 20 grains. I consider the offer of 25 grains with an average of three days to be very reasonable.

Cross-examined by Mr. KINGSFORD: I have inspected the purifying apparatus of the Maidstone Gas Company, and consider it to be of no use in the winter, because it is not sufficiently large. If the Company were placed under a restriction of 20 grains per 100 feet, I should say they would require four more purifiers. The sulphur may have been as low as 12 grains but it has been up to 34 grains. What we have to provide for is, not taking out the sulphur in summer, but doing so in the depth of winter. The variation in the quantity of sulphur is the most aggravating thing a gas manager has to contend with. He may leave the testing-place thinking that all is right, and then may be summoned by some one and told that the sulphur is 30 grains. I have been to 30 grains and more in London in the testing-rooms of the Metropolitan Board of Works or the Corporation, but they do occur in the works themselves, and cause annoyance and misery to the managers. The Maidstone Gas Company up to the present time have not been under any penal obligation to reduce the sulphur in the winter, and had the Company, they would not occur. They are placed under bonds by this Committee, they will have immediately to provide extra purifying machinery.

Mr. George Livezey, examined by Mr. POPE.

I am Engineer and Secretary to the South Metropolitan Gas Company, and have given attention to gas manufacture all my life. I was one of the first who acted in concert with the public authorities in relation to the appointment of Gas Referees in the Metropolis, but my Company was against me. I am familiar with the question of sulphur purification, and consider the Maidstone Company's offer of a restriction of 20 grains and an average of three days to be very liberal. It is better than exists in London. There the average of three days and 20 grains in summer, and a similar average and 25 grains in winter. The average of three days was accepted because there are very great difficulties in ensuring the purification of gas from sulphur compounds. In the first place, the excess is not discovered until the day after it happens; and, in the second place, the gas is not so pure as it is important to state it is to restore the water immediately—or, in fact, even in three days, which is the shortest average which could be accepted as reasonable in any way.

The REFEREE: Do I understand you to say that two days on which there is an excess must be corrected by a diminution on the third day?

Witness: That is what the Acts of 1858, 1868, and 1871, and the South Metropolitan Gas Company, passed in 1876, prescribe this. If there is an excess one day, the amount the day following and the day preceding should be taken with it, and the average of the three days assumed to be the average of that one day.

By the COMMITTEE: The same provisions are contained in the Commercial Gas Company's Act of 1876. A maximum of 20 grains with a three days average means a good deal less than 20 grains on an average.

Cross-examined by Mr. KINGSFORD: In order to keep within the limit of 20 grains, the removal of the sulphur compounds is so uncertain a process that the Company must work to about 10 or 12 grains and 12 candles.

Mr. KINGSFORD: When you say you consider this offer of 20 grains and the three days average an exceedingly liberal one, with what standard of price do you assume that would be taken?

Witness: My instructions were simply to give evidence in relation to the sulphur impurity. All I can say is that if the towns wishes to have gas at a maximum sulphur impurity of 20 grains, they must pay for it. It involves double the extent of purifiers which would otherwise be required if there were no such restriction, and about double the quantity of materials and labour for purifying. With those restrictions the Company must pay for the gas they supply.

You differ from some of the witnesses, who say that 1d. per 1000 feet would be enough?—I take it that 1d. per 1000 feet is interest on capital

expended on the additional plant, and another 1d. for extra labour; and there is the nuisance besides, which the public would have to submit to.

I take it that the nuisance the public would have to submit to, if the pollution of gas were driven into the house would also be considerable?—I have studied that question, and have never found a title of evidence to show that there is an atom of truth in it.

You think that pollution of gas with sulphur is more beneficial than otherwise?—It is certainly totally inappreciable, and not a single public authority which I am aware of would tolerate the pollution of gas with sulphur when once the gas supply gets into their hands. No one has ever asserted that it has the slightest effect upon health, nor have I ever yet met with proof that it affects brass.

By the REFEREE: The Metropolitan Gas Referees issue their Instructions every March and September, but for the last seven or eight years they have not varied from 25 grains for the winter six months, and 20 grains for the summer six months.

A MEMBER OF THE COMMITTEE: Imagine three classes of cases—one where the requirement is that there shall not be more than 20 grains of sulphur at any time; a second where there shall not be more than 20 grains in summer, and 25 in winter; and a third where there shall not be more than 20 grains on an average of three days; would there be any considerable difference in the cost of purification under any of those three conditions?

Witness: Not considerable; I should not put the extreme difference at more than 2d.

The CHAIRMAN: That is what we are arguing about, is it not?

Mr. POPE: The Corporation having refused our overtures, what passed yesterday must be considered to be without prejudice.

The CHAIRMAN said he quite understood this. The Committee, however, wanted to ascertain the actual facts for their guidance hereafter, although at present they had not the sanction.

Mr. Thomas William Keates, examined by Mr. POPE: I am Superintending Gas Examiner to the Metropolitan Board of Works, and have directed my attention to the question of sulphur purification. I think the offer which has been made by the Maidstone Gas Company to the Corporation with regard to sulphur is an extremely liberal one, viz., 20 grains with three days average. It places the Company in a considerably worse position than the London Companies are in, not only on account of the average, but the London Companies have another element of relief. There is a Chief Gas Examiner appointed by the Board of Trade, who is an officer of the Ex-aminer of defective lighting power or want of purity in the gas, the Companies have the power of appealing to that officer, and if he should decide that the defect arises from circumstances beyond the control of the Company, his decision is final, and the Company are exonerated. The quantity of sulphur in London is regulated according to the position of the works, those which are called urban works being allowed a larger quantity than those which are called rural works, the reason being that the material which is used is extraordinarily noxious, and a most stinking and foul thing. It has been found extremely difficult to deal with this material in gas-works which are situated in town—for example, at Fulham, or at the South Metropolitan Company's works.

Witness: I am not qualified to speak on this matter, but I can speak, before us; in your judgment, would that which you think a liberal one of 20 grains on an average, and a three days test, involve any serious expense in addition to the one where you have 25 grains allowed you in the six months of winter?

Witness: I am not prepared to speak as to the cost—that is a question for an engineer; but I am sure that, in proportion as you lower the standard, so you cast upon the Gas Company a very greatly increased onus, because the difficulty of reducing the sulphur from 25 to 20 grains is vastly greater than to reduce it, from 30 to 25, and so the difficulty goes on increasing. The fact is that neither engineers nor chemists have really been able to deal with the question; and although in London the average quantity of sulphur is low, it is kept down solely through the great experience of the Engineers allowing them to work in a sort of empirical way, which enables them to show, but in a way no one can understand, that it can be done.

It is, in fact, rather in the condition of experimental knowledge than scientific knowledge?—It cannot be called scientific knowledge at all, because no one can rightly explain the reason of the process that goes on. The property which produces the effect is a compound of sulphur, but the reason several of the compounds, and the real nature of the sulphur which is efficient is not understood. No gas engineer knows how to meet it. It is subject at times to find himself entirely adrift, and to see circumstances arise that he does not know how to account for, nor how to remedy. I therefore consider that the three days average will be sufficient to form a sort of safety-valve, by means of which gas engineers can recover themselves.

Cross-examined by Mr. KINGSDOWN: I will take it from you that the average of 2400 testings of the London gas has shown only 11·2 grains of sulphur, but I do not know that those figures are correct. I consider the gas-works at Maidstone to be strictly urban; the distance from the nearest house is only about 120 yards, and from the Town Hall about 1100 feet.

The CHAIRMAN said they must certainly be regarded as urban works. Cross-examination resumed: I see no objection to the offer made by the Company of 20 grains on an average, and three days average, but I should not have advised them to make it.

Mr. KINGSDOWN: From the evidence it appears that very great fluctuations occur in the amount of sulphur in the Maidstone gas?

Witness: But they could not then occur to any extent. Cross-examined by Mr. POPE: I am quite prepared to believe the sulphur goes up to 30 grains or even more.

Re-examined by Mr. POPE: In works like those at Maidstone the organization cannot, as a rule, be compared to London works. The Referees say that 25 grains is a fair standard for London in the winter time, and certainly making allowance for the fact that it is situated in Maidstone than they are in London, with all their appliances.

By the COMMITTEES: A maximum of 25 grains would occasion considerably more expense to the Company. The purifying material employed becomes dreadfully foul; the foulness, however, can be diminished, but it involves keeping the material a long time in the purifiers, and this involves the necessity of an increased amount of plant.

Mr. POPE said this was the case on behalf of the promoters.

FRIDAY, JULY 18.

Mr. DUGDALE, on behalf of the Corporation of Maidstone, said that no Bill for the extension of the limits of a gas company had ever before been presented to Parliament back of the year 1875, and that the evidence that was offered by the promoters of the present Bill. There was scarcely anything beyond suggestion or estimate. The only thing definite was contained in the evidence of Mr. Lawrence, who said that he would like to have the money of the Maidstone Gas Company expended in the extension of mains to Hothelbourne, so that he might be able to provide with gas at a cheaper rate than he could manufacture it for. With regard to the con-

sumption in the districts proposed to be added, the only parishes which had been mentioned had small independent supplies of their own at the present time, but none of them had parliamentary powers; and Mr. West's estimate showed how vague and indistinct were the ideas with regard to the consumption of gas which might be expected; because at first he said it would be very small, and then afterwards he brought in an estimate showing a consumption of about 2 million feet per annum. Another point was that extensions ought not to be made unless they would pay—they ought not to be taken out of the pockets of the consumers; and in order to attempt to show the Committee that it would pay, an estimate was produced of the cost the promoters thought would be incurred in carrying out their scheme, which was simply confined to an extension of their mains from the end of their present district to the gasholders in the four villages which were to be added. There was already a supply of gas in this estimate of expenditure was, however, insufficient, because it was quite certain that, if the Company obtained the powers sought for, they must be in a position to lay down more mains, and to add to the places which were supplied at the present time. The companies or individuals who at present lay the supply in these districts had no parliamentary powers; they could not break upon the public roads to lay down more mains; they practically could not do anything without the consent of the Local Authorities; and it did not appear how far those Local Authorities did or did not consent to the present application. Therefore, if the Maidstone Gas Company were to be able to work their new district, they must do what seemed to be the business of the owners of those small undertakings—viz., buy them up, and expend money in affording the districts a new supply; and really no idea had been given of the capital required for this purpose. The extra shilling proposed to be added to the price of the gas was not shown to be sufficient, because the Committee had to keep in view the reality of the increase of capital required in making the extensions would be. The second point was of more practical importance, in the interest of the public, than the first—viz., how much additional capital the Company were to have; and it was not the practice of Parliament to allow gas companies to provide themselves so liberally that should be expended to escape parliamentary supervision for more than a reasonable number of years.

The CHAIRMAN: Ten years is the time placed before us.

Mr. DUGDALE said a table had been produced in which it was stated that it would be necessary to spend £50,000, in round numbers, during the next ten years.

Mr. COOPER said the filled-up Bill showed that £50,000 was the sum which the Gas Company might be required to expend within one year from the passing of the Act, and the remainder of the £90,000 was to be raised in sums not exceeding £10,000 in any succeeding year.

Mr. DUGDALE said he could not be asked to come out of the items in Mr. West's account. The first was that of land, but the Corporation thought it might be wise for the Company to acquire this land in view of the extension of the works within reasonable limits, and therefore nothing much need be said on this point. The next item was that of a new gas-holder; and which the Corporation said would not be required, of the size proposed to be made, for the next ten years; or, if it was required, would not cost anything like the £12,000 which had been put down for it. The petitioners, however, contended that a gasholder of 200,000 feet, or, at the outside, 300,000 feet capacity, would be all that was necessary; and which the Corporation said would not be required. It was true that Mr. West and other witnesses had said they were needed, but when the Committee came to the evidence of Mr. Spicer, they found he said quite the contrary—that the difficulty was not one of the capacity of the purifiers, but the want of chemical knowledge; and this remark would be a valuable piece of evidence. It could consequently be shown clearly and distinctly that this matter of purification was simply and solely a question of care and caution, and that the large expenditure which the Gas Company had made upon their works during the last four years had supplied them with purifiers amply sufficient for some time to come. The sum of £100 for the purchase of land would not be a very serious matter subject to very considerable modification. "New offices, £3000," might seem a large sum, but might be generally assented to. The next item, "Mains in the town and outside," had been divided into £2000 inside and £4000 outside; and therefore if the Committee cut off the extensions at the end of the works, the whole of the capital sum put down at £7000; but why was this wanted? If such a sum was required to be spent, expect to see something in the revenue account for interest paid to the bankers; but there was no item of the kind, and, therefore, it was clear that the money was not required. With regard to the amount overdrawn at the end of this was a sum which had been expended on capital account when there was no cash to meet it. It was said that the works were occupied with the re-structions, and which ought to have been repaid out of the £5000 remaining as balance after payment of the dividends on June 30, 1879. If not devoted to the payment of this sum, it was open to the question put to one of their witnesses, to the effect that if the Company had been paying the dividends without paying their debts; and if they had paid their debts they would still have been able to pay their dividends, because they would have paid their debts out of this balance of net profits. Such being the case with regard to additional capital, it came to the point that the £45,000 was brought down very considerably, probably to £10,000—and if the Committee said that £25,000 would be quite sufficient for all future as well as present requirements, and quite as much as the Company ought to have under the present Bill, they would be dealt with very liberally. The most important point of all, however, was the standard price to be charged for gas, because the Company now were bound by a law which said that they were bound by law to give profit to pay their maximum dividends, they were bound by law to give the consumers the benefit of this profit; but they had not done so, and now they were seeking to be placed under the auction clauses, which had no benefit to the consumers, and which would place the people where they would be. In order, however, to make these clauses work to the consumers, the Company ought not to be placed in a much better position than they were in at present, so that they might be enabled to divide largely-increased profits, and have the additional capital besides. The question of standard price depends entirely upon the actual present position of the Company, which was in 1879, when the price of gas was 3d. per 1000 cubic feet, they were enabled to pay their maximum dividends, with the exception of a small sum, which was put by their own witnesses at 1d. per 1000, making 3s. 4d.; but he (Mr. Dugdale) could not quite make out how they arrived at this price, because when he looked at the accounts for the year he found the balance carried to profit and loss was \$5691, while the dividend for the previous year was \$3548. On the first blush, therefore, it appeared as if the balance carried to profit and loss account on June 30, 1879, was more than sufficient to pay the maximum dividends of their capital.

Mr. COOPER said this amount did not include the interest on borrowed money. Mr. DUGDALE said he was going to remark that he supposed there was the interest on the £10,000. The CHAIRMAN: Should you not for this purpose deal with the maximum dividends upon the capital set forth in the preamble—viz., 10 per cent.

upon £12,500, which is £1250; 4 per cent. upon £12,500, which is £500; and 7½ per cent. upon £25,000, which is £1875?

Mr. DUGDALE said he thought it was hardly necessary to go into detail upon this.

After some conversation,

The CHAIRMAN said that the maximum dividend was £3625, and more than that could not, under any circumstances, be paid. Less had been paid in the previous year, the committee have it in their power to call upon it; but if the maximum dividend and the maximum capital was taken, it would show the extreme limit of the charge against the net profit.

Mr. DUGDALE said this was true, and in June, 1879, the revenue account showed a "Balance carried to profit and loss account, £3631." The charge for gas that year was 3s. 3d. per 1000; and this was the starting-point from which he commenced—that 3s. 3d. was enough to pay the maximum dividends, and not 3s. 4d., as erroneously stated by the witnesses for the Company. He then turned to the question of repair and maintenance of plant, and he thought he was able to prove that the average for works was in such good order as to condition as those at Maidstone was paid 6d. per 1000 feet. The amount in 1879 was 13d., and, therefore, supposing he reckoned 6d. for extraordinary renewals, and 7d. for ordinary renewals, that would knock off 6d. for an ordinary year, and bring the price down to 2s. 9d., at which price the Company would be able to pay their maximum dividends. The Corporation then began to ascend the scale again, and asked the Company to do more than they had hitherto done—to give 16-candle gas instead of about 14½-candle. Of course it was a question of expense, which the Company said would be 3½d. per 1000, but which the Corporation said would be a little less; at any rate, they would say 3d., which would be the price at 18s. But the Corporation wanted more than this—and this was one of the most important of their requirements—they wanted the Company to purify their gas that there should never be more than 20 grains of sulphur in 100 feet of it. The promoters said that in order to do this they must erect additional purifiers to the amount of £7000, which was 1d. per 1000 feet more than the price of gas when the Corporation would agree to, although they did not consider such additional works were needed. The Company next said they must have an addition of 5d. per 1000 feet for interest on new capital to be raised. Upon this point the Corporation said, "You have no right to anything, or only to a small amount, in the first place. You have no right to anything, as you say; and, in the next, you have no right to expend a large amount of capital without producing a commensurate return, and this additional return ought to compensate for the amount of capital so laid out." The Corporation, in reply, said the capital would have to be expended at once, and compensation would be made by a reduced rate of interest. Until the additional income began to accrue; but an extra 5d. to their standard price appeared on this account to be quite exorbitant, and he (Mr. Dugdale) thought 1d. would have been ample. Taking it at 1d. brought the price to 3s. 2d., with 16-candle gas and a limitation to 20 grains of sulphur. The Company, however, no doubt, entitled to something beyond this, because some reasonable increase must be the price of gas; but the price of coal might rise, although coal mines were being opened day after day, and the probability was that prices would never rise to anything like the extent they had at the time of the coal famine. Making all these allowances, if the Committee fixed 3s. 6d. as the standard price, and required the Company at the same time to supply gas of an illuminating power of 16 candles, with the limitation of 20 grains of sulphur, they would very soon begin to declare increased dividends. The next point was the illuminating power, but this was only a matter of price, and no doubt an extra quality was paid for it would be given.

The CHAIRMAN said there was another improvement—the improvement of the burner, which would also improve the quality of the light.

Mr. DUGDALE said this was so, and if all the consumers were to exchange their old burners for the improved ones they might be enabled to obtain a better light, although the article manufactured would be very much the same. Next came the question of the gas being supplied at a reasonable price. The last suggestion made before the Committee was that there should be 20 grains of sulphur present on an average of three days. The presence of sulphur in gas was entirely a question of care and caution in the manufacture, and it would be most unsatisfactory if a company were able to bring forward a quantity of gas containing more than two of which there were 10, and on one 40 grains of sulphur in the gas—and say they had complied with their Act, when the day the test showed 40 grains would be that of the greatest nuisance to those who had to consume the gas. The Committee would be informed by evidence that in places where the sulphur limit was 20 grains, the gas contained more than 40 grains, and to take a considerable amount of care and exercise great caution in order to reduce this impurity to something like 10 grains. Therefore it was not an impossibility, and why should the Maidstone Company be allowed an average of three days, when, with ordinary care, they could control the sulphur all the year round?

The CHAIRMAN: Because at Maidstone they say they cannot get such clever fellows as they have in London.

Mr. DUGDALE said it was only a question of small expense. He was not authorized to speak on this point, but his firm impression was that if the Corporation could make sure of having a limit of 20 grains, they would be willing to pay a little more for the gas. It was very important that gas should be kept as free from sulphur as possible; and the Corporation hoped they would not be placed in a worse position with reference to this matter than other towns were. Then came the subject of testing, but upon this point the promoters appeared to be prepared to concede what was required. Stevenson said he did not think it important that notice should be given.

Mr. COOPER said the present testing-place was objected to.

The CHAIRMAN: If you can agree upon this point, we had better not have any contention about it.

Mr. DUGDALE said there would be no difficulty, provided the testing could be done without notice. The last question related to the reserve-fund authorized by the Gas-Works Clauses Act, 1847, and which he contended was quite sufficient; but the Company had also inserted a clause (17) for the formation of an insurance-fund, and addition, which was wholly unwarranted and unnecessary, and was very objected to altogether. There was also a power sought for to apply any excess of profits, over the standard rate, to the credit of divisible profits in the following year, which meant that if the Company's charge for gas brought in more than sufficient—it might be a great deal, or only a little—to pay the dividend they were entitled to in respect of such charge, instead of reducing the price, they were to keep it in their pockets, and thus be enabled to accumulate a reserve-fund, under the name of divisible profits, to an unlimited extent. This was a very ingenious thing, and the gentleman who drew the Committee's attention to it; but he (Mr. Dugdale) did not think the Committee would sanction it.

The following evidence was then called on behalf of the petitioners:—

Mr. Charles Ellis, examined by Mr. KINGSFORD.

I am an Alderman of the borough of Maidstone, and have been Mayor three times. I was present at a meeting of ratepayers, called under the provisions of the Borough Funds Act, on March 9, at which it was decided

to oppose the present Bill, in the interest of the gas consumers. The Corporation appointed a Committee some time ago to watch the action of the Gas Company, and the Committee have it in their power to call upon the quantity of sulphur in the gas, and also occasionally of the poorness of the light. In my own experience I have had reason to complain.

The CHAIRMAN: Perhaps your supply-pipe is not large enough.

Witness: It is not my fault if it is not. I have sent to the Company for the gas, and they have it sent; and, as to the sulphur, I have complained that corncobs and so forth were damaged. Also, that when I went home of an evening, I could not only smell but taste the gas, which I attributed, whether rightly or wrongly, to an excess of sulphur in it. Dr. Adams, the Medical Officer of Health, is also the Gas Analyst, and his reports are handed in to the Gas Committee of the Corporation once a fortnight.

Mr. KINGSFORD: When speaking of injury caused by the gas, were you referring to any damage done to the stock in your business?

Witness: No; but it does affect goods placed near the ceiling.

The CHAIRMAN: But your complaint is that when you arrived home in the evening you smelled and tasted the gas?

Witness: Yes; it spoiled my appetite.

Examination resumed: I know the outlying districts proposed to be included under this Bill; and in my opinion there has not been any real need expressed or felt by the inhabitants in favour of the present measure.

Cross-examined by Mr. COOPER: My complaint is not that I do not get light enough, but that I get too much smell, which I suppose is sulphur, because it tastes like it. I have frequently had cause of complaint, especially in the winter, but the smell has not been so bad during the last year as it has been in the previous year. I have not any particular date when I have tasted the gas so badly, but it is an ordinary occurrence. The only meeting recently called in connection with the gas question was the one to which I have referred; but four or five years ago there were some meetings held on the subject, although I do not think any action was taken by the Corporation. The Corporation have taken place in the present Bill, and the Gas Company with reference to complaints regarding the illuminating power and purity of the gas, which can doubtless be produced if necessary.

Mr. Horatio Richard Cutbush, examined by Mr. KINGSFORD.

I am an Alderman of the borough of Maidstone, and was present at the meeting of the Corporation, called by the Corporation, on the 9th of March, 1880, at which it was decided to oppose the Bill, and at my place of business the whole of the men have complained very much indeed of the impurity of the gas, and also of its illuminating power. I agree with Mr. Ellis that complaints have been general and frequent in the borough.

Cross-examined by Mr. COOPER: The size of the room in which my men work is between 50 and 60 feet long by 15 to 16 feet wide. About 28 or 30 burners are in the room, but I do not know when those burners were examined; there are, however, never more than 18 burning. I have never personally made any complaint to the Gas Company.

Mr. Matthew Aigmoor Adams, examined by Mr. KINGSFORD.

I am an Alderman of the borough of Maidstone, and am one of the Chemical Society. I am Medical Officer of Health for the borough of Maidstone, and was appointed Gas Analyst in 1876. Since that time I have presented fortnightly reports as to the quality of the gas, although I have made many more than fortnightly testings. The average illuminating power during the last 4½ years has been 14½ candles, and the average amount of sulphur per 100 feet has been 25-87 grains. The maximum amount was on Aug. 28, 1877, when it was 55-55 grains, and the minimum was on June 26, 1879, when it was 8-61 grains. I have often heard complaints as to the sulphur, which I consider to have been reasonable. In testing for illuminating power I use one of Sugg's No. 1 "London" Argand burners, which gives a better result by 4 candles than the burner specified in the Act of 1858, which was the old Argand burner with 15 holes. In my opinion, therefore, a 16-candle limit would be a fair and proper one, and it would be restoring to the public their original rights. In testing for sulphur I use the further improved Argand burner now in use. I consider a high illuminating power of gas important from a sanitary point of view, because poor gas produces more impurities as a result of its combustion than a rich and good gas. I specially referred to the Town Council on the question of sulphur in 1877, in consequence of the great complaint being made about the gas containing sulphur, and I endeavoured to explain, not only the disadvantage of the impurity from sulphur, but also the difficulties which stood in the way of the accomplishment of purity. Similar complaints were general in the early part of 1879, my reports showing 450 grains on Jan. 29, and 424 grains on Feb. 8. I have often heard complaints as to the sulphur, and I have endeavoured to produce a corrosive action on metallic surfaces specially, and also on textile fabrics, caused through the production of oil of vitriol.

Mr. MICHAEL said he should like to take the opinion of the Committee before going further into the matter. The promoters had offered terms to the Corporation, proposing that they should be limited to a certain quantity of sulphur, and, therefore, what was the use of entering into the question of the past, whether good, bad, or indifferent, but when they were under no restriction whatever.

The CHAIRMAN: We should have some evidence at hand, but not to be gone into at any length.

Mr. MICHAEL said the Company were willing to be placed under restrictions which were very uncommon; was it right, therefore, to occupy so much time in going into a long discussion, which had taken days and days in other Committees, and without any practical result when the main question was conceded?

The CHAIRMAN: I remarked that there appeared very little difference between the parties.

Mr. MICHAEL said that in London three days average was allowed, and his clients were quite willing that the same limit should extend to them, so that when any accidental circumstance occurred, opportunity might be given for making complaint.

Mr. KINGSFORD said there was a good deal of reason in his friend's remarks, the Company having admitted a limit of 20 grains.

The CHAIRMAN said the Committee were of opinion that it was wholly unnecessary to go any time about the gas containing sulphur, and the offer to purify up to a certain point.

Mr. KINGSFORD said his scientific evidence would be addressed to the unreasonableness of the three days average.

Mr. MICHAEL said [hesitatingly]: Do you think that there ought to be a more stringent regulation imposed than 20 grains of sulphur in 100 feet of gas, with an average of three days?

Witness: I am not in a position to form a proper and correct judgment upon that question, which is entirely a practical matter. The only way I can form an opinion is by looking down at the gas testing, which have taken place in London, and these show that the sulphur never runs up, speaking roughly, to anything like that amount.

By the COMMITTEE: Out of 2400 testings made at Beckton and at Friendly Place, Mile End Road, on only two occasions was the quantity of sulphur above 20 grains—viz., 21 and 20-6; and in both cases these amounts were satisfactorily accounted for as accidental.

Mr. KINGFORD: From your knowledge of the works at Maidstone, is there any difficulty in keeping this impurity down to 20 grains?

Witness: That, again, is a practical question.

Cross-examined by Mr. MICHAEL: I am quite aware that sulphur cannot be crossed down without means being taken to prevent it.

Mr. MICHAEL: That involves the difficulty of removing one nuisance by creating another, does it not?

Witness: I think the nuisance business, since it has been taken in hand, has been overcome.

As to the alleged deficiency of four candles in illuminating power, the test is not used, nor is one universally adopted?—Yes.

I suppose no test could give more illuminating power than really exists in the gas?—It depends upon the instrument employed.

Take any instrument you like to employ?—That is mere sophistry.

The Committee will judge whether it is a fair question or not; can you answer it?—I believe gas burners will yet be devised that will give more illuminating power.

But can any burner, now or hereafter to be devised, give more illuminating power than is contained in the gas?—Of course not.

It is open to every consumer in Maidstone to use the same sort of burner as you have done, is it not?—With certain qualifications, yes; but it is too costly for the majority of people, the price being something like 7s. 6d. each.

Are there not flat-flame burners that give exactly the same illuminating power as Sugg's Argand?—I cannot answer. I am an analyst of gas, but not an analyst of burners.

Mr. Thomas Hawksley, examined by Mr. KINGFORD.

I have been consulted at intervals by the Maidstone Corporation for about 25 years, and have been over the works of the Gas Company, which are in a very excellent condition; indeed, they are what may be called gas works new, but I am quite in all respects, though not in one another gasholder for about 250,000 cubic feet would be an advantage. It is not absolutely necessary for the present supply of gas, but it is requisite in view of an extension of the demand. I may here explain that in all towns of this magnitude, not being manufacturing towns under the Ten Hours Bill, holders of the gasholder of three quarters of a day's supply are quite ample. The gasholders at Maidstone do contain about this quantity, but they are on the verge of becoming insufficient, and therefore I think that another gasholder of about the size I have mentioned would carry the Company on for probably the next seven years. The cost would be about £6000 or £8000, I should say.

The CHAIRMAN: The promoters of the present Bill are preparing for an estimated increased storage of 500,000 feet, as against 250,000 which you state?

Witness: I think that is quite out of the question, and not good engineering either; it is obviously better to have, in small works like these, two gasholders each of half the proposed size, instead of one gasholder of large size, which by accident might go out, and then nearly all the storage would be lost; whereas if you put the same quantity of gas into two vessels, you would only lose one, besides you save the bulk of the storage for the next year.

Examination resumed: I do not think additional purifiers are required. The new ones which have been erected recently are perfectly capable of purifying 14 million cubic feet of gas per diem. There are also six old ones of no mean size in themselves, but I do not reckon upon them at all. About new ones are capable, with proper arrangement and intelligent management, of reducing the sulphur down to 15 grains as a maximum, although 20 grains ought, in my opinion, to be allowed as a margin. I have had as large experience in this matter as probably any person in England; but I would rather refer to the practical results of others who have been obliged to put purification imposed by Parliament. Take the case of Beckton. The sulphur impurity was reduced last October to an average of 10½ grains in 100 feet; in November it was 12½ grains; in December it was 12½ grains; and during the whole of those three months no one day did it exceed 18½ grains. In January the average was 11½ grains; in February 11½ grains; in March, 11½ grains; the largest amount in those three months being 15½ grains. In this case there ought not to be any difficulty arising from the suggested nuisance of removing the foul line. Of course engineers and gas manufacturers will have their own notions about the proper mode of using oxide of iron and lime as gas purification, but I do not think that purification by lime only is the best method, but it is quite common to use both—lime and oxide of iron—and then lime, and sometimes the reverse; but I have no doubt that the proper way is to use oxide first, so as to take out the sulphuretted hydrogen, and then afterwards to use the lime only for the purpose of taking out the particles of oxide and the carbonic acid. All free elements of impurities can be perfectly removed by this system, and by purifiers of much less size than those recently put down at Maidstone. Purification is too commonly left in the hands of ordinary workmen, and it frequently happens that the purifiers are so arranged that it is not impossible for a workman to make a mistake, or to use an erroneous discretion, or to be guilty of improper neglect. If the valves are so arranged that they can be used in any other order than the right one, it might happen that the workmen will pass the gas through the wrong purifier, and when this is the case the gas will go into the town in an imperfectly purified condition, and the consumers will be very much annoyed, because the air in their apartments becomes fouled, and good and sound workmen are made ill, which gas is capable of attacking, will be seriously injured. I know that sulphuric acid is very extensively generated by the combustion of gas containing sulphur in any form; and I have collected in my own office very large quantities of acid, and I have obtained accidentally, which has been produced in that way—so much so that I once obtained a hoghead in a year.

Mr. MICHAEL: A hoghead of sulphuric acid?

Witness: No; not of pure sulphuric acid, but of water very strongly impregnated with sulphuric acid.

Examination resumed: I do not want a word to say against the purifiers, but there is a better system, and if I had it here I could show how to absolutely prevent the risk of impurity getting into the town. The cost of purifying gas from sulphur down to the 20 grains would be 1d. per 1000 feet, independent, of course, of all interest on the capital expended in the construction of the purifiers. The interest of £700 for working capital is a very curious one. The shares ought to provide this working capital, but apparently it is not the practice here. It seems on an investigation of the accounts that the capital has been provided out of profits.

Mr. KINGFORD: Consequently the Company are now in such a position of daily expenditure and receipts that the bankers do not require to charge them any interest?

Witness: I do not know what may be the case with regard to a current account. It is quite possible that at times the Company may overdraw, and at other times they may have money in their bankers hands; but upon the general principle of the thing the answer I have given applies.

Mr. MICHAEL: But there is a charge on overdrawn accounts?

Witness: When shares are sold by public auction, as proposed in this Bill, it is always possible to provide the bankers with sufficient capital to draw upon.

Examination resumed: With regard to the new capital, I think £50,000, with the ordinary borrowing powers in addition, would be ample, and would last the Company for ten years, at a rate of increase of 7 per cent. They have already provided for the payment of their works for a million feet of gas, and therefore to my mind they cannot spend £50,000 in ten years.

Mr. KINGFORD: Coming to the standard price of the gas, I find from the Company's accounts for 1879 that they paid the maximum dividends with a charge of 3s. 3d. per 1000 feet?

Witness: Yes; and applying money to other purposes besides.

In 1879 the sum of £5820 was expended for repairs and maintenance; what, in your opinion, would be the average amount necessary to be expended on those items in future years?—The usual allowance is 5d. per 1000 feet; but I have allowed 6d., for the purpose of being somewhat in excess.

7d. 2?—No; I will not, because it is not according to fact. They have charged 18d., which is certainly an overcharge of 7d.

What have they overcharged 7d. for?—Repairs and maintenance of works, no doubt; but they ought to have been building other works, and have mixed their accounts.

So that for the 3s. 3d. we ought, according to your estimate, to take 7d., bringing it down to 2s. 8d. per 1000 feet, at which the Company could pay their present maximum dividends?—Yes.

Starting from that point, we require an increase to 16 candles; how much ought to be added for this?—Supposing it was a real increase, it ought to be 3d. per 1000 feet, and this would make 5d., but the same gas will give a different illuminating power according to the kind of burner used.

Then the Company ask to be allowed a percentage upon their new capital; what do you say to that?—I have nothing to say to it, because I do not understand it; it appears to me to be simply absurd. Supposing, however, they only erect the works now which are reasonably necessary for the next few years, they ought to have such a price allowed as would enable them to obtain 7 per cent. upon the outlay.

Taking all matters into consideration, what do you think would be a fair price to pay for this gas?—I would give them a standard price of 3s. 6d. per 1000 feet, which would be ample.

Examination continued: The question of illuminating power is only one of paying a little more, using a little more candle, or drawing a little less of the weak gas out of ordinary coal.

Mr. KINGFORD: In your opinion, is there any objection to the 20 grains of sulphur with a three days average?

Witness: I believe the three days average has never yet been granted, because it is a palpable absurdity; it condemns itself. I have shown that it is quite practicable to bring the amount of sulphur down to 10 grains, or even less; and the consequence of the three days average would probably be that in one day the Company's gas would contain 40 grains of sulphur, and stink the whole of the consumers out, while on the other two days there would be only 10 grains in it.

By the CHAIRMAN: Of course, by searching through Acts of Parliament you could find a clause to suit any purpose, but I do not know of an instance in which such a clause as is proposed in this Bill is inserted.

Examination resumed: Most of the places proposed to be included in the new district are very small; some of them contain only from 200 to 800 inhabitants.

By the COMMITTEES: There are 11 villages, with a population of 9764 persons, within the 3-mile radius, and 12 villages, with a population of 11,287, between the 3 and the 4 mile radius. The villages already supplied contain 5756 inhabitants, leaving 15,295 of the entire population unsupplied.

Cross-examined by Mr. LEIGH: I can give several instances of Companies being restricted to 20 grains of sulphur, because I have a list of this kind (referring to a paper). The first which catches my eye is the Dublin Gas Company—20 grains, but no average clause. Then there is the British Gas Company. I was also Engineer for the Bill of the Newcastle-upon-Tyne Gas Company, which there was a 20-grain restriction clause, both in their 1867 and also in their 1879 Act.

Mr. LEIGH said there was a restriction in the latter Act which was as follows:—"The gas supplied shall not, unless in the case of unavoidable cause, contain more than 20 grains of sulphur in every 100 cubic feet, as ascertained by the apparatus in use by the Metropolitan Gas Refiners' Association." That was not an exception; it was simply a prescription, and if it is inserted in this Bill it will help the Corporation, and I shall be very glad to have it there. As penalties are to be inflicted, I think the clause is reasonable.

Do you see any objection to the words in the Shrewsbury Gas Act of 1876, "that on any one day the gas be of less purity or illuminating power than that prescribed by this Act, the average testing under this Act made on that day, and on the preceding day and on the following day, shall be deemed to represent the purity of that day"?—Very much indeed. It is a totally unusual, and a very improper clause; enacted by Parliament, I dare say, but not upon conflict.

But surely you cannot get over the fact that in the South Metropolitan Gas Act of 1876 the same clause was inserted, and likewise in the Chartered and Commercial Gas Companies Acts?—Not in the case of the Chartered Company. I have before said that where penalties are to be attached to the clause, the clause must be stringent, and there ought to be always an exception for unavoidable causes.

By the CHAIRMAN: The clause which has been read is an absolute absurdity, because it defeats its object, which is to give the inhabitants, not "pure gas," but "reasonably pure gas"—that is to say, containing not more than 20 grains of sulphur.

Mr. LEIGH: As a matter of fact, do you not know that The Gaslight and Coke Company, the Commercial Gas Company, and the South Metropolitan Gas Company have a Bill in Parliament this year to make prior provision for regulating the supply of gas by those companies or raters, the Corporation of London have promoted a Bill with this object?

Witness: I do not.

The CHAIRMAN: The Bill has not been before a Committee of this House yet, I believe.

Mr. LEIGH: No; it has been settled, by consent, between the Corporation of City of London, the Metropolitan Board of Works, and the Companies, by the Board of Trade.

The CHAIRMAN said he thought it was scarcely a precedent for a Committee on a contested Bill.

Witness said the question in dispute was raised by a Bill brought in by two or three companies a few years ago, and rejected by Parliament.

Mr. LEIGH: Are not these clauses, which you say are so exceptional, re-enactments of the Metropolitan legislation with reference to gas companies since 1875 and 1876?

Witness: Certainly not; and I wish you could produce anything which would lead to that conclusion.

Is not the process for taking out the sulphur an uncertain one?—It is uncertain within certain limits, but not beyond those limits. There is no

difficultly at all; and what greater proof can there be than the results of the system adopted in London?

In the Gaslight and Coke Company's Act of 1876, and the South Metropolitan Company's Act of the same year, the three days average is allowed. Were not both these Acts based upon the Commercial Company's Act of the preceding year?—Allow me to read it [referring to the Act]. I see the clauses there have practically the effect you have mentioned.

Has not the three days average clause been allowed because the process for taking out the sulphur is too uncertain to permit it to be done invariably?—If you apply it to the 20 grains it is a mistake, but if you apply it to less than 20 grains it is not a mistake. Gas made from ordinary descriptions of coal can be regularly and uniformly purified within the limit of 20 grains by reasonable care and attention.

Do you not know that so far as the London Companies are concerned the Gas Refreres actually allow 25 grains during six months of the year, and 20 grains during the other six months, and that is all we ask for now?—That was because the purifying apparatus was of the old sort, and not well adapted for the purpose within the limit I have mentioned.

But that is *plus* the three days average?—You do not understand the question a bit. The 25 grains are only temporary; the Companies will not be allowed that quantity when their apparatus is in proper condition.

You put the word "temporarily" upon me. Has it not existed since 1875?—Yes; because in most cases these old works are much in the same condition as they were then.

Did it have existed since 1868?—I dare say it has. Then I do not think it is quite fair to say I do not understand the question a bit?—I do not think you do, or else you would not keep putting such questions when I have told you what has happened practically. I have done it, and am still doing it in a great number of cases, and other people are doing so.

In answer to the Chairman, Mr. LEIGH said his object was to ascertain why a Company in a country town was to be placed in a worse position than one in London.

Witness said he did not think this was the case.

Mr. LEIGH: But I say we are.

Witness: I do not admit it for a moment. If the London Companies were in as good a position as you, they would be very glad.

Cross-examination continued: The London Companies have a power of appeal to the Chief Gas Examiner, but it is in respect of unavoidable circumstances, and I think this power of appeal is perfectly just. In Maidstone there is no such officer, but there is an appeal to the Justices. It would not be an unavoidable case if any mishap arose through negligence. In London the Chief Gas Examiner has refused to give a certificate on certain occasions, and penalties have very properly been levied upon the Companies in consequence. It is also quite possible that the Justices will allow relief to the Company if their cause is justified, and in that case they would be exonerated. I can give plenty of instances in which gas companies have had the restriction to 20 grains of sulphur imposed upon them all the year round. The first place which strikes me is Cambridge, where the clause was inserted in 1867, and there is no difficulty in working within the limits. The works there are in fact at the extremity of the town, and have very good buildings and schools around them. I cannot tell you the rateable value of the houses near the gas-works. Then there is the case of Weymouth, where I should think there are many an examiner, but I do not know who he is. I cannot say whether any reports are sent to the Justices, but their cause is justified, and I do not see them. I certainly say that a suburban company should be placed under as great a restriction with regard to sulphur as an urban company.

Mr. LEIGH: Will you grant that if we are placed under a 20 grain limitation clause it will be necessary that our purifiers should be in the very best order?

Witness: That is a question I do not comprehend, because purifiers are of a common iron construction.

Mr. LEIGH: We should, at all events, have to put up new purifiers?

The CHAIRMAN: No. Mr. Hawley has stated that the purifiers are sufficient, and that is all that is in dispute.

Mr. LEIGH: That is a total contradiction of the evidence given by your General Manager?

Witness: If your General Manager has said that without qualification, I do disagree with him.

The CHAIRMAN: Mr. Hawley says the existing purifiers can reduce the sulphur to 16 grains, and that no additional ones are required.

Mr. LEIGH: In eliminating or reducing sulphur to 16 grains, what do you add by way of expense? Do you give us 1d. per 1000 feet for that in the standard price?

Witness: I have included it in the standard price as being part of your ordinary expenditure.

I asked the question not on my own authority, but on that of Mr. Livesey, who said: "I have considered the question of price to this extent, that a certain standard is sufficient without restrictions, but they would require 2d. per 1000 feet more with these restrictions"?—I do not know what he means—if he means all restrictions.

The CHAIRMAN: No; he means expressly 20 grains.

Witness: It is perfect nonsense. The whole course of purification, so far as respects the purifying materials, is under 1d. anywhere.

Mr. LEIGH: That is a great authority on this question, is he not?

Witness: Not if he said that.

Cross-examination continued: The South Metropolitan Company are so flourishing that they are enabled to sell gas, and purify it, at 8s. per 1000 feet, and I believe their £100 shares stand at £205. I cannot say what the Maidstone Company's shares will fetch if they do their duty properly, and if they are subject to what counsel call restrictions, but which I only call obligations to do their duty properly.

Mr. LEIGH: Is it owing to Mr. Livesey's good management that the South Metropolitan Company has been developed in the way it has?

Witness: I cannot answer such a question as that with regard to another professional engineer.

Mr. LEIGH: But you say he talks nonsense.

The CHAIRMAN: Mr. Hawley qualifies that by saying the nonsense is what he said on a particular point.

Witness: Yes; they required 2d. per 1000 feet to purify gas properly, when it is done everywhere else for 1d.

Mr. LEIGH: There is 1d. for capital and 1d. for the removal of the sulphur compounds; this is how the 2d. is made up?

Witness: That is an obvious mistake. One penny represents exactly 2d. of course, and 5 per cent, which is the expenditure upon purifiers additional to what they have, at which would be something like £9000. The whole of the purifiers together did not cost one-third or one-fourth of the money; so the matter does not bear reducing to calculation.

[At this stage of the proceedings the further cross-examination of the witness was postponed till the following Monday.]

CLAY CROSS GAS SUPPLY.—It is stated that the Clay Cross Local Board have made an offer to the local Gas Company to purchase their works for £12,000, which is just double what they cost.

Legal Intelligence.

SALFORD HUNDRED QUARTER SESSIONS.—WEDNESDAY, JULY 7. (Before Mr. W. H. HOGG, Q.C., and a Bench of Magistrates.)

THE STRETFORD GAS COMPANY AND THEIR ACCOUNTS.

It may be remembered that, at the April sittings of the Court, a Mr. W. Aldred, of Manchester, was appointed to examine the accounts of the Stretford Gas Company, and to report upon them, in order that it might be determined whether or not a reduction in the price of gas could be ordered.

Mr. TAYLOR, now as before, appeared for the petitioners upon whose request Mr. Aldred was appointed; while Mr. NASH represented the Company.

Mr. TAYLOR said he appeared on behalf of a number of ratepayers of Stretford and the district, in an action brought by them against the Stretford Gas Company under the Gas-Works Clauses Act, 1847, relative to the price charged for gas and other matters connected with the Company's affairs. The case had been fixed for hearing, and he asked if it would be convenient to proceed with it at once.

The CHAIRMAN said he had looked over the report Mr. Aldred had made, but he did not think it was sufficient. What the Court required was that there should be a balance-sheet prepared for every year which was covered by the report, to show what was the condition of things upon those balance-sheets under the provisions of the Gas-Works Clauses Act—that was to say, allowing for the year 1878, the year 1879, and what was the balance which ought to have been in the hands of the Company, and what ought to have been the price of gas to the consumers.

Mr. TAYLOR: The balance-sheets presented are those which by Act of Parliament the Company are bound to send to the proper authority.

The CHAIRMAN: The Court requires is that a competent person should show from the accounts of the Company, by separate balance-sheets for each year, what ought to have been the price of gas to the consumers.

Mr. TAYLOR: What I have to direct your attention to is this, that the actual state of things is shown upon the schedule of accounts sent in by Mr. Aldred. This shows that the Company have misappropriated and paid beyond the limited percentage allowed by their Act of Parliament £17,000. That is what appears on the accounts.

The CHAIRMAN: But it does not show what the price of gas ought to have been in the years covered by the report.

Mr. TAYLOR: What I submit that the Court has to inquire into is this, and nothing more, not what the actual state and condition of things was in various and previous years, but the actual state and condition of things at the time when the matter came before the Court. This is shown upon Mr. Aldred's report, and upon the schedule of accounts. It appears upon Mr. Aldred's report, according to the present price of gas, what the difference would be. A sum of £3000 has been credited to the undertakers, and upon it a dividend has been paid to the extreme limit of the Company's Act of Parliament; and then further there has been a contribution of £17,000, which, of course, is also in express violation of the Act of Parliament; and in addition to this they have paid dividends free of income-tax, likewise against the Act of Parliament, amounting to £1000.

The CHAIRMAN: There are gentlemen on the other side who are going to call a number of accounts in conflict with Mr. Aldred's statement.

Mr. NASH: This is an ingenious version or gloss put upon certain figures. Anything can be done with figures, as you know.

The CHAIRMAN: Practically it will come to this. The matter must be inquired into.

Cour. TAYLOR: Yes; and what I submit is that this is the proper time to inquire into it.

Mr. NASH said his clients desired that the matter should be fully inquired into, and Mr. Aldred's statement would be answered by Mr. Locock Webb, Q.C., who had been called in by the Directors of the Company.

But the Court evidently thought there had been any misapprehension whatever. The Directors had done for themselves, for which, if they liked, they might have called in highly-paid services.

Mr. TAYLOR: And they have received £400 a year for it.

The CHAIRMAN: It does not follow that, if they have saved £60,000 a year, doing so without the consent of the Wolverhampton Company, they are doing so indirectly, more than 10 per cent, of course.

It was then agreed to take the case on the 6th of October next.

WOLVERHAMPTON PETTY SESSIONS.—MONDAY, JULY 12.

(Before Messrs. G. L. UNDERHILL, W. H. ROGERS, M. IRONMONGER, and E. DIXON.)

THE USE OF FOUL GAS LINE IN AGRICULTURE.

John Spiera, a toll collector on the Stafford Road, was summoned by Mr. Samuel Cliffe, a farmer, for taking 6d. as toll for two horses and a cart, which was claimed were exempted from toll on the ground that the cart contained gas lime required for the improvement of agriculture.

Mr. E. H. THORNE appeared for the Complainant, and Mr. R. A. WILCOCK defended on behalf of the lessee of the tolls.

Mr. THORNE briefly explained that the point in dispute was whether "a gas lime" came within the exemption of the Turnpike Acts. The gas lime was in fact a sulphur gas for the improvement of agriculture. It was not used on the land alone, but was generally mixed with soil and manure heaps before it was distributed over the land.

Complaint was called, and spoke to sending his man for a load of gas lime to the Stafford Road works of the Wolverhampton Company, and the demand of the defendant 6d. for toll, which he paid under protest. He said he never paid tolls for loads of gas lime until the defendant took charge of the gate in question. He mixed the gas lime with refuse from ditches, &c., and it had the effect of destroying all the weeds. He frequently mixed the gas lime with manure, and then distributed it over the land to enrich it. Pure lime was the best, but gas lime was both cheaper and more easily obtained.

Mr. E. W. T. Jones, the Borough and County Analyst, and also Analyst to the Staffordshire Agricultural Society, described the process which was used for the purification of gas, and its application to land. Pure lime was, he said, necessary for the fertility of land, and gas lime, which contained traces of ammonia, was used for no other purpose than as a fertilizer of land. In combination with manure it furnished sulphur, and so became valuable for the cultivation of land.

Mr. WILCOCK, in his defence, contended that neither pure lime nor gas lime was exempted from toll.

Mr. THORNE said the main question was whether gas lime was "lime," or a chemical only for the purpose of improving the land.

Mr. ROGERS said he had been connected with the Turnpike Trust for 20 years, and had never before heard of toll being taken for gas lime. The late lessee never charged for it.

Mr. WILCOCK said a similar case had been decided at Monmouth in favour of a lessee of tolls there.

Mr. ROGERS pointed out that while gas lime was used for no other

purpose than manure, farmers might draw pure lime, and say it was for their farms, when in reality they might want some of it for use on the land and the other for building purposes. So far as he was concerned he knew that it was pure gas, and he was not at all about to be expected from toll, and he would take care to have it exempted in the next lessee's agreement.

The Bench were unanimously of opinion that gas lime was "a manure," but as this was a test case they only fined the defendant a nominal sum of 1s. and costs. MR. PHOENIX said he found that in the Monmouth case referred to by Mr. Willcock no analyst gave evidence.

Miscellaneous News.

EUROPEAN GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held at the London Offices, Austin Friars, last Wednesday—WILLIAM WHITE, Esq., presiding. The CHAIRMAN, in opening the proceedings, said: I am very sorry to inform you that Mr. Dozell's health has prevented him from acting as Secretary for several months past, and, pending other arrangements, Mr. Backler will officiate on this occasion, and I will now ask him to read the notice convening the meeting.

MR. BACKLER having accordingly read the notice, he also read the following report of the Directors, and the audited accounts and balance-sheet of the Company for the year ending March 31, 1880.

The relapse in trade, which deceived many expectations, founded on the activity that prevailed for a limited time, has affected the interests of this Company to some extent, by preventing a general increase in the consumption of gas.

In some cases the falling off in retail trade has been considerable, Bolbec having suffered a reduction of 154 per cent., and Aulnay of 7 per cent.

The aggregate increase at the seven stations is, however, at the net rate of 3 per cent., notwithstanding the severe frost of last winter, which prejudicially influenced the Company's business.

In several localities the mains suffered material damage from the same cause, whereby leakage was increased, and much trouble and expense incurred to cure the evil.

In the latter part of the month a sewer at Bouleaux burst, on a length of about a quarter of a mile, and occasioned serious injury to several of this Company's pipes. An official inquiry is now being conducted to ascertain the cause of the accident, and to fix the liability for compensation.

On March 31, 1879, the total net profits at the stations were £20,007 s. 7d., and on the 31st of March last they amounted to £24,737 10s. 3d., showing an increase of £4,730 s. 3d.; to which must be added the interest on the sum of £260 s. 3d., the total surplus, £3870 10s. 10d., after making ample provision, as usual, for every contingency that could be foreseen.

The favourable results of the coals were obtained throughout the year contributed in no inconsiderable degree to this result. On the other hand, some additional expenses were necessarily incurred, especially for wages, to satisfy demands which the Directors found it impossible altogether to reject.

It is gratifying to remark that, whilst passing through such difficult times, the bad debts of the year amount to £191 only at all the stations.

At Nantes the excavation of a tank, to receive the proposed new gasholder, is proceeding but slowly, owing to the difficult nature of the ground, but all other extensions previously referred to as in progress at that station are about to be completed.

The auxiliary works at Sotteville, near Rouen, are in course of construction, and it is intended to bring them into operation in time for next winter's requirements.

The Directors see no present need to incur any large expenditure of capital, and venture to anticipate that the advantages of past outlay will soon be materially appreciable in the shape of improved power.

For many years past this Company has supplied gas consumers with fittings and stoves on moderate terms, so as to reduce to a minimum the preliminary expense attending the first use of gas. Such facilities have been further developed during the past year. Show-rooms have now been opened in the most frequented parts of the towns lighted by the Company, gas-engines have been introduced and placed in considerable numbers, and the efforts of the staff have been carefully made to attract attention to the great advantages of gas for lighting, heating, cooking, and power.

The use of coke has also been popularized and extended by adapting it to the wants of purchasers; the system of breaking it into small pieces, by machinery, already partially practised by this Company for some years, being now more generally adopted.

The manufacture of sulphate of ammonia has likewise become a source of increasing profit, owing to the improvements in the process.

The Shareholders will observe that an intelligent spirit of progress pervades the various departments of the Company's business, and the Directors believe that this cannot but not only maintain the undertaking in its present efficient state, but to secure still greater advantages in the future.

Under these favourable circumstances they recommend the declaration of a dividend of 2s. per share on the paid-up share, and on the same proportion of the reserve fund, called, all free of income-tax; leaving a balance of £3580 9s. 9d. to be added to the reserve of undivided profits.

MR. DE DIRECTOR—WILLIAM WHITE, Esq., and Henry Solomon, Esq.—and both Auditors—George Harrison, Esq., and Edward Garay, Esq.—who will retire from office at this meeting, have given notice of their intention to offer themselves for re-election.

The CHAIRMAN: Gentlemen, it becomes my duty now to move the adoption of the report and the accounts which you have had read to you, and to make a few remarks upon the report, which you all see is rather favourable. The opening of the report seemed to be of rather a gloomy character, but if that impression was produced on your minds, it must have been removed by the sequel. We have been disappointed in the reduction in the consumption of gas in December and January, but, on the other hand, we have been able to make a very considerable saving, as a whole, we consider our business to be in a very satisfactory position, and have frequently remarked that it is a great advantage to us to have several stations, because, as a general rule, a falling-off in one or two of them is compensated by improvements in the others. This is signally the case with respect to the past year, where the effect of the suspension of the lighting in the theatres has been more than counterbalanced by the improvement realized elsewhere, and I may say that the energetic measures we have used to push our business has been the main cause of this favourable result. In localities where our mains could not be laid at a depth—in the French towns there are a great many arches underground, and this prevents us from laying our mains as deeply as we could wish—they suffered severely from the changes of temperature during last winter; but we have had all the weak parts inspected and repaired where necessary, and I think the increase of leakage which caused us some pecuniary loss, is now a very small matter. As a consequence, of course, we are subject occasionally to such contingencies or accidents as these, and must meet them as they occur. The frost also had the effect of freezing the water in such a large number of meters, that many consumers, with Oriental apathy, made up their minds that they were the victims of the frost, and, instead of adopting means to free their meters from ice, quietly resigned themselves to use oil and candles until the thaw came. The servants of the Company not having the power of ubiquity could only attend to a limited number of consumers at one time, and so from one reason and another the rental for the months of December and January suffered severely. It is not likely that such sharp weather will recur, but the future has many bad times, from which we have not yet emerged, we have succeeded in doing so well, we have every reason to believe that the better times, when they come for others, are not

less likely to be satisfactory to ourselves. If there are any other points in the report or the business of the Company generally on which any further information is desired, I shall be happy to answer any questions or hear any remarks. I now propose—That the report of the Directors and the accounts now read be received and adopted.

MR. SOLOMON seconded the motion.

MR. E. JONES said he was rather disappointed at the Chairman's remarks as to the reduction in the consumption of gas in December and January, but he was glad to see that he wanted of proper diligence on the part of the officers of the Company.

The CHAIRMAN: I did not say that.

MR. JONES said that this was the interpretation he put upon the Chairman's remarks. It seemed to him (Mr. Jones) that greater vigilance should in future be given to the meters, in the event of a severe winter. He thought it rather matter for congratulation that there had been a severe winter, because he had on former occasions heard the Chairman complain somewhat bitterly of the mildness of the winter preventing the Company getting rid of all their coke. Now he complained that, with a more severe winter, there had been a reduction in the consumption of gas.

MR. WHITEFOOT pointed out that the remark of the Chairman was, that the officers of the Company could not be ubiquitous, which implied that where they had had the time and opportunity they had given their services to meet the difficulty which arose.

The CHAIRMAN: It would never answer our purpose to keep a much larger staff than is generally necessary, simply to meet a case of severe frost; but we did the best we could at the time.

The motion was then put, and carried unanimously, as was also one for the declaration of the dividend mentioned in the report.

On the motion of Mr. CHAIRMAN, the Chairman, seconded by Mr. ROAN, Mr. W. White was unanimously re-elected a Director.

The CHAIRMAN, in returning thanks for his re-election, referred to his having been a Director of the Company for something like 31 years, and said that ever since he had had anything to do with it the Shareholders have been almost unanimous in re-electing him whenever his time for retiring came round. He thought, therefore, that they had been satisfied with the management of the Company. He then moved the re-election of Mr. H. Solomon as a Director of the Company.

MR. E. F. WHITE seconded the motion, and it was carried unanimously. The Chairman then expressed his acknowledgments, the retiring Auditors were also re-elected.

On the motion of Professor TAYLOR, seconded by Mr. FRANKS, a vote of thanks was unanimously accorded to the Chairman and Directors.

On the motion of Mr. PHILL, a vote of thanks was passed to Mr. Backler, for his long and faithful discharge of the duties of the office.

The CHAIRMAN: First of all I would thank you in the name of the Directors for passing this vote of thanks to them and to myself. As I have often said, the Directors endeavour to do their duty. We work well and harmoniously together, and you, as Shareholders, see the result of our working. I am very much satisfied that we work advantageously in the interests of the Company.

MR. BACKLER expressed his gratitude at the vote of thanks that had been passed to him, which, filling as he did the dual position of Director and General Manager, he accepted not only for himself but for all the officers of the Company. With regard to the special occasion which had brought this motion forward, he very much regretted the absence of his friend Mr. Dozell. They had worked cordially together for 24 years, and there had scarcely been a day on which Mr. Dozell had been absent from illness during that time. He was in some measure his (Mr. Backler's) own pupil, for he had trained him from very early days to fulfil his duties, and he fulfilled them remarkably well till illness struck him down. He did not despair of his further assistance, but whether they had it or not the Shareholders might rely upon it that the business of the Company would be conducted in such an efficient and regular manner as to ensure its success. He was very glad to see the spirit in every department, both at home and abroad, and it was really a pleasure to resume his former duties and put on harness again, as he had done, after an interval of some years, surrounded by a zealous staff, who were willing to do everything which he considered necessary for the benefit of the Company, and to do it in the most harmonious manner.

The proceedings then terminated.

SOCIÉTÉ TECHNIQUE DE L'INDUSTRIE DU GAZ EN FRANCE.

[Abstracted from *Le Journal des Usines à Gaz*.]

The Seventh Annual Meeting of this Society was held in the Hall of the Society of Civil Engineers, Paris, on the 21st, 22nd, and 23rd ult., under the presidency of M. JORDAN. There was a very good attendance of members.

The proceedings opened on the morning of the 21st with the transaction of the usual routine business, on the conclusion of which the names of the gentlemen who had applied to be admitted as Ordinary Members or Associates of the Society were put to the meeting, and approved of. Of the former there were 27, and of the latter 10.

The President remarked that the members of the Society had been invited to a conference to be held by M. Jamin, a Member of the Institute, on the following evening; he further stated that the Paris Gas Company had given permission for the members to visit the new works in course of construction at Clichy, where arrangements would be made to render the visit as interesting as possible, and to place the members at the afternoon of the 23rd. He then proceeded to deliver his Inaugural Address, the chief points of which we may shortly have an opportunity of laying before our readers.

The Address was received with applause. The Treasurer (M. Foucart) presented his report on the financial position of the Society, and it was unanimously approved of.

MR. LECLECH then read a report on the subject of the prizes to be awarded by the Society. It stated that with reference to the sum of 4000 frs. (£100) which it had been agreed to award to the authors of the best papers on any subject specially characterised by the particular industry to which the prize was recommended that the sum of 1000 frs. (£40) should be given to the author of the only paper sent in, which bore the motto "*L'Union fait la Force*," and the title of which was "*On the Construction of a Telescopic Gas-holder*." With regard to the premium of 1200 frs. (£48) which was to be shared between the authors of the two best papers presented at the meeting of 1879, by members of the Society, the Committee reported that there were three papers which specially attracted attention. They were as follows:—"*On the Influence of the Rarefaction of Air, Barometric Pressure, and Temperature on the Illuminating Power of Gas*," by M. Brimond; "*On Burners of High Lighting Power*," by M. Brimond; "*On Burners of High Lighting Power*," by M. Coze; and a "*Note on Burners of High Lighting Power*," by M. Ellissen. The Committee considered each of these papers worthy of a premium, and they therefore proposed that three prizes should be awarded the value of two, the value of each to be fixed at 250 frs. (£10), and that this amount should be handed over to the authors of the papers indicated.

The report then proceeded to specify the names and qualification of the foremen or workmen whom the Committee deemed worthy of the prizes of 200 frs. given by the Society for the longest and most satisfactory period of service in gas-works. With regard to the prize competition for 1880-81, the Committee proposed that, as last year, the sum of 5400 frs. should be devoted to prizes, as follows:—A sum of 4000 frs. to be divided among the authors of the best papers on any subject whatever specially connected with the gas industry; a prize of 1200 frs. to be divided among the authors of the best papers presented to the meeting of the year 1880; and the usual workman's prize of 200 frs.; the Committee, as before, to determine the conditions of the competition.

The report was unanimously adopted.

The sealed envelope bearing the motto, "*L'Union fait la Force*," was then opened, and it was found to contain the names of M. Monnier, Civil Engineer, Paris, and M. Thibaudet, Engineer of the Marseilles Gas-Works; and to these gentlemen, therefore, the prize of 1000 frs. was awarded.

The meeting then proceeded to the election of five members to serve on the Committee to replace those retiring; also of a gentleman to act as Secretary of the Committee in lieu of M. Leclerc, who had announced his inability any longer to hold that office, on account of engagements. M. Commail, of Marseilles, having expressed his willingness to undertake the duties, his name was submitted to the meeting, and the sitting closed.

The following gentlemen are the office-bearers for the ensuing year:—President, M. Ellisson; Vice-President, M. Foncort; Treasurer, M. Vée; Secretaries, MM. Monnier and Commail.

After the afternoon sitting the reading of the papers presented to the meeting commenced, and these and their discussions thereon occupied the members for the remainder of the first, the whole of the second, and a portion of the third day. The following is a list of the papers and communications:—

"Some New Appliances for Heating by Coke," by M. Amiel.

"Pressure Indicator, &c., and a New Method of Lighting Gas-Lamps from the Outside," by M. Brouard.

"Application of the Hot System of Condensation, with the Object of Increasing Illuminating Power and Preventing Deposits of Naphthalene," by M. Cadel.

"A Heat Regulator, for Heating by Gas," by M. Chamon.

"System of Crushing and Small Coal and Coke, for Use in the Manufacture of Compressed Fuel," by M. Chaplet.

"Note on the Automatic Working of the Exhausters at Nancy," by M. Constantin.

"A New Kind of Tap," by M. Daquin.

"Apparatus for Lighting Gas, or Partial Prevention of Gas Pressure in the Retorts," by M. Dessirier.

"Ovens of Nine and Eleven Retorts of Small Section," by M. Eichelbrenner.

"Improvements in the Falconetti Gas Meter," by M. Falconetti.

"On the Construction of the Apparatus for Preventing the Heating of Coals when Shipped," by M. Foncort.

"On the Unit of Light employed in Photometric Trials," by M. Giroud.

"On Marini's High Power Burner," by M. Goelzer.

"India-rubber Joints for Gas Mains during the Winter of 1879-80. Construction of a Gasholder Tank-Wall," by M. de Lachomette.

"On the Employment of Tar in the Production of Gas," by M. Lebreton.

"On Rights of Way. On a Level Indicator for Liquid Reservoirs and Gasholders. Pension Funds for the Benefit of the Employés on Gas Works," by M. Leclerc.

"On the Treatment of Ammoniacal Liquor," by M. Marché.

"On the Noise Produced by Gas Appliances," by M. Motet.

"Trials of Lighting for the Unloading of Ships and the Transhipment of Goods by Night," by M. Ponsin.

"A New Kind of Ascension-Pipe," by M. Renaux.

"On the Utilization of Breeze in Gas-Works," by M. Rouget.

"Theories for the Calculation of the Thermal Experiments according to the Plan of Dumas and Regnault. Verification of the Effectual Purification of Gas," by M. Salanson.

"Vertical Condensers. A lateral Knee-piece for Gasholders. Gas-holders of all kinds. Retort Chugging Machine. Alarm Signal for Indicating Excess of Pressure and the Over-filling of Gas-holders," by M. Servier.

"Methodical Washing of Gas by Means of Coke Scrubbers," by M. Vacher.

On the evening of the first day of the meeting the members of the Society, to the number of over 100, and their friends, among whom were the principal officers of the Paris Gas Company, had a banquet at the Hotel Continental. The President occupied the chair, and the toasts proposed by himself, M. Arson, and M. Vautier were cordially received. After dinner the company proceeded to inspect the large burners designed by M. Marini and M. Bengel, which had been fitted up in the courtyard of the hotel.

On the following evening the members assembled in the Avenue du Maine, at the laboratory of M. Jamin, who, at the special request of the President, had made arrangements for a thorough inspection by them of the electric lamp bearing his name. In a few well-chosen remarks M. Jamin welcomed his so-called enemies and competitors, and then proceeded to give them a succinct description of the mechanism of his lamp; after which M. Demazeure, M. Jamin's assistant, explained in his own personal estimate of the net cost of the electric light compared with gas. During the visit, 40 of M. Jamin's lamps, supplied by means of several steam and gas engines, were set in operation for about an hour.

The morning of the last day of the meeting, Wednesday, the 23rd ult., was spent in the disposal of the business of the Society, and the members devoted to visiting the new works of the Paris Gas Company at Clichy, on the banks of the Seine. Every possible effort had been made by the General Director of the Company (M. Camus) in order to render the visit—which he personally superintended, accompanied by the Sub-Director, M. Godot, and the Staff—one that should be alike interesting and instructive to the members of the Society. The several Engineers of the Company conducted the visitors, divided into small parties, round the works, explaining as they did so every detail in connection with the working plant and general arrangement of what is destined to become the most important of the Company's stations, being, as it is, laid out for a yearly production of more than 60 million cubic metres, or about 2118 million cubic feet of gas. After the inspection of the works the members assembled in the extensive purifying-house, where luncheon was served, and the cordiality with which toasts to the success of the Paris Gas Company and to the health of their eminent Director were hoisted, rendered the gratification of the visitors at the cordial reception they had met with.

With this visit the programme of proceedings was exhausted. Those of the members, however, who prolonged their stay in Paris went on the Thursday to the gas-works at Boulogne-sur-Mer, for the purpose of seeing in operation the retort-chugging machinery of MM. Servier, Monnier, and Rouget.

THE RECENT GAS EXPLOSION IN THE METROPOLIS.

ADJOURNED INQUEST.

The inquiry into the circumstances attending the deaths of Albert William Beasley and William Beasley, who were killed on the evening of Monday, the 5th inst., under circumstances recorded in the last number of the JOURNAL, was resumed on Tuesday last, at the Marylebone Court House, before Mr. HARDWICKE.

Mr. BEASLEY again appeared on behalf of The Gaslight and Coke Company, Mr. WEBSTER, J.C., for Messrs. John Ald and Sons; and Mr. SARSON, Mr. WILLIS, and Mr. GORTON watched the proceedings on behalf of the owners of damaged property and the survivors of the deceased.

Mr. VERNON HARCOURT, one of the Metropolitan Gas Referees, attended as the representative of the Board of Trade.

Inching up the Court, the County Bench, who had referred to the fact of the advantage the jury would have on this occasion in the presence of Mr. Vernon Harcourt, who had been sent by the Board of Trade to assist him in conducting the inquiry, and, if necessary, to give evidence as to the explosion. There would, he said, be brought before them two persons who at witness to the explosion in Bayley Street, and the District Surveyors of St. Pancras would be in attendance to answer any questions.

Mr. BEASLEY reiterated the remarks made by him, on the opening of the inquiry on the previous Thursday, as to the desire of The Gaslight and Coke Company to afford every facility for a thorough investigation into the circumstances attending the explosion, especially with reference to the cause of it. He said that the dead main, and he was sure they would have the assistance of Mr. Harcourt in eliciting from the witnesses some evidence as to how an explosive mixture found its way into that main.

Mr. WEBSTER said, on behalf of Messrs. John Ald and Sons, he could fully endorse what Mr. Beasley had said.

The following evidence was then taken:—
By Mr. BEASLEY: I was a gasfitter, and reside near Tottenham Court Road. On the evening of Monday, the 5th inst., at about three minutes to 7 o'clock, I was passing up Tottenham Court Road, when my attention was called to the pressure-gauge on the end of the main, in the trench at the corner of Bayley Street. Three men were in the trench examining round the cap on the main. I observed that the pressure-gauge was rather higher than what I thought was usual, and this attracted my attention. I thought there was a good reason on, but did not make any remarks to anybody. The foreman came out of the trench, unfixed the pressure-gauge, and put his hand to the 4-inch stand-pipe. I do not know whether it was a light he applied, but I thought it was a cap. [Witness: All the explosions occurred within two minutes. One of the men was a loud clap caused by the cap that was on the main striking the other part of the pipe, and then I heard a rumbling noise like thunder going away in the distance—a sort of "thud," repeated five or six times. I should think there was an interval of a couple of seconds between each "thud." All the explosions occurred within two minutes. One of the men was picked up in the trench, and Hawkes went up the pipe and fetched out the other man. There was no smell of gas that I could perceive.

By the JURY: I am in the habit of using pressure-gauges.

By the CORONER: I have had occasions to try pressure-gauges in buildings, but I never found them having much effect. The pressure of this is not sufficient to blow the water out of the gauge. I cannot say whether the water was blown out of this gauge.

By Mr. VERNON HARCOURT: I thought there was pressure in the main from feeling the gauge down on one side, and up on the other. I was about 6 or 7 feet identified. From the gauge and the valve, the seal it clearly there was a force. I was looking at the men at work in the trench by the Bedford Head on Monday, the 5th inst. They were cutting the lead out of the joint of the cap on the main. The pressure-gauge having been taken off the stand-pipe, one of the men struck a match and applied it to the pipe, and directly he did so the explosion occurred. The man who was cutting the joint was driven up the pipe on the opposite side of the trench. I did not hear the other explosions. After the men were brought out of the trench I went to the corner of Percy Street, and saw that the road had been torn up.

By Mr. HAWKES: The explosion followed immediately upon the match being applied to the pipe. I saw no flame but that of the match.

Joseph M. Cartney said: I am a foreman in the service of The Gaslight and Coke Company, and was inspector over the men employed to lay down these pipes. We commenced the work on the 1st of March. I saw the mains laid from Howland Street, and the valve there was put in by Mr. Vacher, and we were ready to work it as we reached the spot, and I left it safe and sound. I saw six lengths of pipe laid from it down Charlotte Street, and then I had to leave the work in consequence of the sudden death of my wife. We were working up from Tottenham Court Road to Howland Street. I do not know when the connection was made between Charlotte Street and Howland Street.

By Mr. BEASLEY: I had nothing to do with the eastern section of the main, from the Bedford Head to Goswell Road. The empty pipes on the western section were put down about the 20th of March. [Model of valve produced.] The valve now produced is a model of the patent valve which was put in at Howland Street. In the ordinary course of business the valve is tested by the patentees; then by the Gas Company at Haggerstone, with water; and again when brought to the job. In order to make all sure we face it with Russian tallow. A cap was put on the valve. I did not notice any particular smell of gas after the valve had been put in, and there is no smell of gas usually a smell of gas is not there. When I went inside the main to cement the joints there was no smell of gas. On Monday, the 1st of March, I reported that the valve was in good working order, and that it seemed perfectly tight.

By the CORONER: We had been altering a 12 and an 8-inch main, and the escape of gas I smell would probably proceed from these pipes; there is some gas escape when we have the end of a main open. At one time four Companies supplied this district, and the escape, if there was an escape, would be from one of the old mains. I cannot account for the gas getting into the new main.

Mr. HARCOURT: Is there any other means you can suggest by which the gas could have entered the main, except through the valve?

Witness: There are a great many things which might be suggested. Supposing there was a fracture in the dead main, and a leakage was taking place from another pipe, the gas would enter the dead main. There could not have been much gas present; if there had been the explosion would not have occurred.

THE CORONER: Do you think there was a fracture in the large main?

Witness: I was not there when the main was tested, so that I do not know.

Mr. HARCOURT: Have you ever known of a case such as this, in which gas was found to have leaked into a main which had not been brought into use?

Witness: I have; it occurred some time ago in Camden Town, when we were making temporary connections.

By the CORONER: Is there any light test a pipe when I require it, but I cannot say why it is necessary there was for it here, as I was not present. I believe the gas is strong enough to burn.

William Hawkes, the contractors foreman, was recalled, and produced the pressure-gauge he had used in the main. He said: "The gauge is always filled with pure water. From the marks on the glass it can be seen where the water stood from Saturday, the 3rd inst., to the following Monday; there was no pressure indicated—it was down at zero. If there had been any pressure we should have had to use a bag before taking the plug out of the main. Knowing it was connected with a live main, I took the precaution of trying it with a light. There was a little smell of gas, but no pressure. My opinion is that the gas must have got through the valve. I cannot say that any one had been trying it. If it were opened for a minute a large quantity of gas would pass through. People cannot get to the valve."

By the JURY: I do not believe that the keys of the water-mains fit our valves.

By Mr. BESLEY: The valve was taken off the pipe between six and seven o'clock in the evening. I applied the match directly I took the gauge off. I am quite sure the gauge stood at zero.

By Mr. WEBSTER: I did not use pressure-gauges.

By Mr. WILLIS: I have applied a light to a stand-pipe before, and when I have done so the gas, if there has been any, has flared, but has not exploded. I did not know that air when mixed with gas was explosive. I was not aware of the danger.

By the JURY: I did not smell any gas. The reason I applied a light was because I knew the main was connected with a live main, and therefore I thought I would take this precaution.

By the CORONER: I am now wise enough to know there was gas in the main, and I think that gas got through the valve. It is possible that it might have oozed out of it for some time, but I do not think it could have got into the new main, because the castings are quite perfect.

Charles Hales said: I am foreman for Messrs. Aird and Sons. I had charge of the laying of these pipes, and it is part of my duty to see that they are perfect, and that the joints are properly made. The pipes are quite an inch thick, and I do not see how gas could get into the new main from the old ones. We generally find a smell of gas when we open the ground, but there was not such a quantity in this case as to prevent our breathing properly. Sometimes we find the air charged with gas, but we do not think it necessary to use a safety-lamp. If there is plenty of gas we light it.

By Mr. HARCOURT: When laying this main we did not find a leakage sufficient to light.

By Mr. WEBSTER: After the pipes are laid we test them to see whether there is a leakage. This is done by forcing pure atmospheric air into the mains by means of a pump, and we are laying it out by the pressure-gauge in order to see whether any air escapes. I never knew of a pipe being cracked by the pressure of gas. A crack in a pipe before it is laid can be detected by sounding them. None of the pipes in this case were imperfect; not a single one was rejected. I saw that they were all sound before they were laid, and I do not see how gas could get into the main and having tried it I found it to be perfectly safe. After laying seven lengths of pipe from the valve down Charlotte Street, we went to Bayley Street and worked back.

By Mr. HARCOURT: After the valve was fixed it was tested with fire, to see whether any gas escaped. The pipes are caulked with yarn, and then from 2½ to 3 inches of lead run in. I look at every joint before it is filled in.

By Mr. BESLEY: The pipes are not supplied by Messrs. Aird; they are supplied by Messrs. Cochrane. There is no motive for putting in a bad pipe. If we found a bad pipe we would reject it.

Mr. William B. Scott, Chief Surveyor for the district of St. Pancras, said: I have been called upon by my Vestry to investigate and report on this accident, and I have visited the neighbourhood in order to see what damage was done to the property of the Vestry. While the main-laying was going on in the jurisdiction I had was in regard to the reinstating of the roadway. The contractors and the Gas Company are bound to give us notice in writing of a trench being filled in, and also of their intention to lay a main. I had notice that certain works were being done within the limits of the parish. The first operation is to sink trial pits to see what is underneath the roadway, and then to lay the main. This, and after the main is laid the Company give us notice that the road is ready to be reinstated. I have no jurisdiction over the mains or the works, and have not in the present case interfered in any way. I have no power to compel the Company to lay the pipes at such a distance below the surface of the roadway to render them safe from a steam roller. I have never been called upon to express an opinion whether a distance of 2 feet from the surface might prove dangerous, but no doubt it is an important point. A 36-inch main would only bear a certain pressure, and it might be damaged by a steam roller passing over it. A steam roller is used in some of the streets of our parish, and we have had instances of water-pipes being broken by it. I have not formed any opinion as to how the gas found its way into this main.

Mr. Frederick Wallen, District Surveyor for the Metropolitan Board of Works, said: About 18 houses in my district have been rendered dangerous by this explosion. I have reported them to the Metropolitan Board, but I have not reported as to the explosion. I have no jurisdiction over the Gas Company, nor have I any control over the roads. I have authority only as to the structure of the houses, and not then until called upon to give an opinion. I have no authority as to actions commenced in the courts which may be taken against the houses. Some of these houses have been injured by the explosion, and I have reported the fact, but I have no authority over causes which lead to these dangers, nor can I control the laying of mains which may have an injurious effect upon properties.

The CORONER remarked that he thought it would be as well to have evidence as to the preparation of the mains for the reception of the gas.

Mr. Thomas Charles Hersey, Chief Inspector of The Gaslight and Coke Company, said: The means adopted to expel the air from a main when there are about to fill with gas is very simple. We allow the gas to flow into the main by opening a valve on an already charged main, and the entrance of the gas at one end gradually drives out the air at the other. We had a 2-inch pipe screwed into the 36-inch main, and when the connection was made we should have gradually opened the valve at Howland Street and forced the air out of the main. I should attend to this duty myself, and wait until I found pure gas coming from the pipe. The operation of expelling the air was to have taken place last Wednesday, and would have occupied about six or eight hours; but it would have depended entirely upon how far the valve was opened. In this case I should have done this gradually. When I found pure gas coming, I should have laid the main closed.

A JUROR: How do you know when you have pure gas?

Witness: We have a small wrought-iron pipe, with a cock upon it, and when we smell gas at the pipe we apply a light.

Could you not supply the workmen with some mechanism to test with?—They have nothing to do with the testing; I do this myself. I am only responsible for what is done by the men under my directions.

By Mr. WILLIS: Hawkes had no right to apply the light; it was done

without orders from me. I object to a light being used in the case of an escape.

By Mr. BESLEY: We had to remove old gas and water mains during the progress of the main-laying-work, but the pipes so removed were properly replaced under my direction. Valves are tested by the patentee before delivery, afterwards at the Company's works, and again on the spot before being fixed. When the valve is placed in position, the spindle actuating it is about 2 inches below the surface of the roadway. On the 1st of March, after the valve was fixed, I told a man to go through the six lengths of main to try it with a light, and he reported that it was sound. The main was then capped, and from that date there was no indication, in any shape or form, of the valve being defective. When we subsequently went to make the connection with the portion of the main going westward from Bayley Street, and took the cap off the six lengths of pipe, the air inside was found to be perfectly sweet. I had the cap placed on the six lengths of main laid from the valve when we stopped the work at that point. I laid a sufficient quantity of main down Charlotte Street to clear the roadway to Howland Street, and then worked towards the valve from the other end. This was done because some years ago a man who had crawled up a long length of main was suffocated by some gas in it. There is no possibility, now that the accident has occurred, of our being able to give a positive opinion as to whether the valve had been tampered with, it having been blown to pieces by the explosion. I think there is a water-pipe closed by the valve.

By Mr. WEBSTER: It is our practice to test the mains for tightness, and this main had been tested, and reported sound, on the Friday previous to the accident.

By the JURY: I believe the key of the water-main will fit our valve.

By Mr. HARCOURT: Can you inform me whether this main had been tested for tightness by air being pumped into it?

Witness: Yes; that was done by Messrs. Aird and Sons under my superintendence. The pressure was on from half-past eleven on the Thursday morning before the accident till the following Sunday, when it went off; that is to say, the air had leaked out of the main as it always does. If there is a fractured socket in the main the pressure will not rise; but in a large main like this if you can get the pressure up 2 feet in half an hour, as we did, it may be regarded as perfect. We do not expect to have any tightness in a large main.

Have you ever known of a dead main becoming charged with gas?—I do not know of a case.

You say you recollect a man being killed by gas finding its way into a pipe?—That occurred 30 years ago, when we were laying a main across Cyril Park. The main was laid, and we were working the joints inside, was suffocated. In consequence of that accident I would not allow the men to work from the valve in Howland Street, but up to it. I do not think the gas that found its way into the new main escaped through the valve; my theory is that it escaped from one of the small mains, and entered through a fractured socket in a large main.

The CORONER: With relation to the diffusion of gases, are you aware that gases will diffuse themselves most rapidly through a small aperture?

Witness: I certainly was not aware of that.

Mr. HARCOURT: Is it your opinion that, but for the unfortunate application of the light, you would have found the joints in the main manner?

Witness: I believe so; I have no reason to suppose otherwise.

As to the practice of testing for gas, was it, in your opinion, exceptional that the contents of the main, should have been tested in this manner, contrary to the ordinary good practice of laying gas-mains?—I do not think so; there was nothing wrong in the common in what we were doing, so far as our practice is concerned.

In applying a light?—I say there was no necessity to apply a light; I thought they were alluding to the testing of the main.

The CORONER: Previous to the air being made to escape in the manner you have described, you think it would not be a proper act to apply a light?

Witness: As I supposed there was only air in the main, I should not have expected to get anything by applying a light. The foreman found there was no pressure nor smell of gas, and, knowing that the main was closed, he applied a light to the main, in order to see if there was any additional precaution. Seeing that there was no gas in the main, I should not have applied a light.

Mr. HARCOURT: If there could not be any gas in the main, the test was useless, and if there was any the application of a light would be very dangerous.

Witness: Yes.

This length of main had been closed for nearly two months?—Yes. During which time it lay in a soil in which gas may have been present, and having at one end a valve which may have leaked?—It may have lain in soil saturated with gas.

The CORONER: Gas was present in the soil?

Witness: Yes; so the foreman Hales stated.

Are you so satisfied with the joints of your mains that you think they are unable to be permeated with gas?—Quite satisfied.

Then how is it that the leakage of gas takes place to the extent it does?—Because the mains were not laid so well 20 years ago as they are now. I am perfectly satisfied with the method of joining; it does not admit of external leakage.

Mr. HARCOURT: In cases of this kind it is not necessary to test with a light?

Witness: Quite so.

Would it not be possible, by giving stringent instructions to workmen, to prevent the danger attending such testing?—This is a new thing to us.

By the JURY: If 10 per cent. of gas were in the main, it would amount to about the same as the ordinary pressure of some 1½ inches of gas to protect the spindle attached to the valve; it is placed in an iron box, but there is nothing to prevent a person maliciously tampering with it. The key of the valve is kept in my office.

In this case, was not a question put by a Juror as to the power of a light to travel backwards?

Mr. HARCOURT said: Until this event, I should have thought it improbable that a light would have travelled down a ½-inch pipe into a gas-main.

The CORONER said the only remaining point was as to how the gas got into the main, and upon this he should like to have the opinion of an experienced person.

Mr. William Foster said: I am a Master of Arts, and am Professor of Chemistry and Physics at the Middlesex Hospital. For 21 years I have been Gas Examiner to the Metropolitan Board of Works. I have visited the scene of the explosion, and have made some investigations on the subject. It is my opinion that the explosion was due to the presence in the main of an admixture of coal gas with atmospheric air.

The CORONER: What are the smallest proportions which you think would form a dangerous explosive mixture, and its maximum.

Witness: The maximum would require about 9 parts of air to 1 of gas; that is the maximum degree of explosive air. Then on each side less air, less explosive; more air, less explosive. One part to 9 parts is a 10 per cent. mixture, and this would be less explosive than 1 part to 8.

of the inhabitants. He thought it was too much to give the whole of the balance for public improvements.

Baillie M'Gown said it was quite clear that if they adopted the Chairman's line of argument, they would never have any more public improvements at Paisley. The framers of the Corporation Act of 1870 and Provost Murray, who was an able and sagacious man, would surely not have put in a clause such as the last one, which had been quoted, unless they had some expectation of a little more money for public improvements. It was unreasonable to speak of giving the £1500 to pay off a portion of the late extension of the works that had been all added to capital. In the year 1869, for instance, there was a surplus from the Gas Trust of £1876, which was relatively more than they now spoke about. That was carried forward as proposed to be done with the past year's surplus. The income last year was £25,000, as against £15,000 in 1869, and in 1871 the income was £18,000, and the surplus was added to the same fund. It was said these large consumers of gas were paying for the public improvements. He admitted that this was not the case. He held that generations past had paid very high prices for gas, and it was out of the prices thus paid that the works were in such a splendid condition. They were now able to sell gas at 3s. 9d. per 1000 feet, and he submitted that 3s. 3d. was about the lowest price in any community in Scotland. He found in Edinburgh that it was 3s. 1, in Glasgow, 3s. 10d., Aberdeen and Greenock, 4s. 2d. each; Stirling, 4s. 2d.; and Kilmarnock, 4s. 7d. The only town where it was 1d. less than they were was Dundee, but that gas was only equal to 24 or 25 candles, which was not to be compared to theirs.

Treasurer RUSSELL. There is one at 3s. 6d.

Baillie M'GOWN. Galashiels; but the consumers pay for the service-pipes from the Company's mains. He had no sympathy whatever with the outcry that the gas-works were in danger on account of discoveries. He held that the gas undertaking was the best property connected with the Corporation. Assuming the price paid for gas-works on a recent occasion to be the same as that paid for the Glasgow Gas Co., which was about £130,000, while it was admitted that the debt was under £60,000. If they annually took out £1000 to redeem the debt, and gave cheap gas at the same time, it seemed to him in accordance with the Corporation's Act of Parliament that they might apply some of the profits for public purposes. He then closed round by Baillie M'GOWN, who said the £1300 was to be used to increase the works and to redeem capital. Since 1870, when the Corporation obtained the management of the works, they had paid over £17,785, which made in all £47,785 for extensions, and redemptions of stock and payment of interest; and he thought the public ought to get the advantage of that money by getting cheap gas at 3s. 9d. per 1000 feet, and he would have a surplus of £4500 next year, and what were they going to do with it? He had no objection to the £1500 standing over as Baillie M'GOWN moved, but he wished 24d. taken off the price of gas, thus making it 3s. 6d. Supposing they did this, they would still have £1800 surplus at the end of the year, which they would make £3600; if they did not take off £1500 towards paying off the debt, they would have still £1800 of a surplus, and he had no objection that the £1500 be added to it.

Baillie SPENS supported Treasurer Russell, as he did not see why they should not give the community cheaper gas.

MR. JOHNSON thought the first thing was to say what was to be the price of gas in the future, and then what they should do with the present surplus of £1830. He considered the whole amount of the surplus should go back as part payment of the older portion of the works destroyed previously to the erection of the new ones. He should be sorry indeed if the whole surplus went that way. He thought it was better to have it all expended for the future. He certainly supported the resolution moved by Baillie M'GOWN, that the £1530 should not be voted for the reduction of the debt incurred in connection with the past extensions of the works, but should be set aside. He intended afterwards to give notice of motion that £150 of the surplus be allocated to extinguish the debt on the Brodie Park.

In reply to a question,

The CHAIRMAN said his motion was that the £1530 be applied for paying off the debts incurred in extension and maintaining the works as required by clause 5 of section 85 of the Corporation's Act of 1870, while Baillie M'GOWN's amendment was that the surplus be not dealt with in the meantime.

A motion to delay the further consideration of the matter was then agreed to, Treasurer Russell, saying he would, on the debate being resumed, take the opportunity of moving that the price of gas be reduced.

It is stated that at the forthcoming meeting of the Sanitary Institute of Great Britain, to be held in Exeter in September next, a large number of gas cooking and heating stoves will be among the exhibits in the group of lighting and ventilating appliances. In connection with this matter we learn that the Exeter Gas Company have decided on offering medals and prizes for the best description of cooking-stoves heated by gas.

KILMARNOCK CORPORATION GAS SUPPLY.—At the usual monthly meeting of the Kilmarnock Town Council, on Wednesday, the 7th inst., the annual report of the Gas Committee was presented. It showed that there was a profit on the year's transactions of £794 11s. 9d. to be added to profit and loss account, from which sum there fell to be deducted £686 15s. as sinking-fund, being 14 per cent. on £49,450 of mortgage debt and bonds, in accordance with the Municipal Extension Act of 1871. The gas sold amounted to 37,060,150 cubic feet, being 1,769,850 cubic feet less than last year. The value of gas sold for the year ending 1879 was £8701 17s. 3d.; for the year just closed, £8497 13s. 9d.; being £404 3s. 7d. less. Meters were also showed a decrease of £14 10s. 8d., there being 118 consumers fewer than in the preceding year. The income for coke showed £38 18s. less than in 1879, arising partly from a smaller consumption of coals, and partly from the lower price received for the coke itself. The income from the chemical works was £1098 15s. 2d., being £178 14s. 0d. less than last year. This was accounted for from the fact of 473 tons of coals less consumed last year, and also by a fall in value of tar, naphtha, and ammonia. The revenue from these was equal to 6s. 0d. per ton of coke carbonized, as against 5s. 9d. last year. The loss of income from gas sold, meters, chemicals, works, &c., was more than met by the reduced expenditure in coals used, dross, wages, lime, meters, and other accounts. Instead of carrying the cost of the extensions effected last year, the gas-works account as formerly, the whole cost of them, amounting to £675 12s. 3d., was paid out of revenue. The outlay during the year for extensions of works and street-mains amounted to £675 12s. 3d.

OLDHAM CORPORATION GAS SUPPLY.

From the last annual report of Mr. Herbert Andrew, the Superintendent of the Oldham Corporation Gas Department, it appears that during the twelve months ending March 25, the expenditure on capital account was as follows:

Hignishaw gas station	£4793 11 7
Hollinwood	177 9 10
Gas-mains	1370 15 11

£6312 0 4

The amount of gross profits was £25,808 19s. 10d., and after paying therefrom the annuities, the interest on mortgages, and £2248 to the sinking-funds, there remained a net profit of £14,324 12s. 7d. From this surplus it has been resolved to pay the sum of £13,500 to the borough-fund, leaving a balance of £824 12s. 7d. for disposal.

The price charged for gas was 2s. 9d. per 1000 feet, with discounts, as in previous years, varying with the consumption "within the municipal borough," "beyond the municipal borough, but within the limits of supply," and "beyond the limits of supply" respectively.

The quantity of gas manufactured was as follows:—

Oldham gas station	169,881,000 cubic feet.
Hignishaw	169,617,000 "
Hollinwood	159,490,000 "
Royleton	29,114,000 "

Total 484,102,000 cubic feet.

Against 464,033,000 cubic feet in the preceding year; and the quantity of canal and coke carbonized in its manufacture was 48,543 tons 121 cwt. The average increase in the year 242 tons 23 cwt. The average quantity of gas made per ton of canal and coke carbonized was 9971 cubic feet. The quantity of gas delivered was 483,501,000 cubic feet, against 464,068,000 cubic feet in the previous year, or an increase of 4,433 per cent. The loss from leakage and condensation was 27,179,000 cubic feet, or 5.621 per cent. of the quantity delivered. The maximum quantity delivered in 24 hours was 3,235,000 cubic feet on Dec. 31, and the greatest production was 2,875,000 cubic feet. The average illuminating power of the gas was equal to 18.35 candles, the standard in the Corporation Act being 14 candles.

During the past year 1751 new meters were fixed and 1348 consumers added. The total number of meters now in use is 31,640, and the number of consumers is 30,924. The length of gas-mains laid in extensions, enlargements, and renewals was 10,850 yards, and mains taken up 1704 yards. The number of public lamps within the district of supply is 2788, being an increase for the year of 96. There are now 2014 public lamps within the corporate borough, and 774 in the out-townships.

The total amount of capital borrowed on the 25th of March was £280,570, with unexhausted power to the extent of £3880; while £44,050 has been redeemed from the sinking-funds since the Corporation Act of 1850 was passed.

The capital account shows that the sum of £100,000 is debited as the cost of the transfer of the old Company's undertaking on the 31st of July, 1853—viz., the value of the works and mains, as per the Company's books at the time of the purchase, £69,155 10s. 8d.; and amount paid for goodwill to the Company, on estimating the annuities at 25 years purchase, £40,844 9s. 4d. There had been expended by the Corporation (exclusive of the £6934 0s. 4d. mentioned above) £235,412 18s. 11d. on extensions.

The revenue account was as follows:—

Dr.—Revenue Account for the Year ending March 25, 1880.	
Manufacture of gas—	
Canal and coke, including carriage, unloading, &c.	£35,987 17 2
Purifying materials and wages.	2,925 19 10
Oil, water, and sundries.	535 2 0
Rent of telegraph.	57 0 0
Salaries of Manager and Officers at works.	1,065 2 6
Lights (carbo-nizing).	6 10 0
Repairs and maintenance of works and plant, &c.	7,208 1 7
	£35,465 12 4
Distribution of gas—	
Salaries and wages of Officers and Rental Clerks.	£1,723 13 7
Repairs, maintenance, and renewal of mains and of service-pipes (less old materials sold, £292 10s. 5d.).	1,542 10 10
Inspectors' uniform.	70 0 6
Services, meters, &c.	2,241 17 8
	£5,478 9 7
Rents, rates, and taxes	2,468 4 5
Management—	
Salaries of Superintendent and Clerks.	£290 4 8
Collectors.	304 2 0
Proportion of Town Clerks' and Treasurer's salaries.	230 0 0
Stationery, printing, advertising, and stamps.	237 17 9
General establishment charges and incidentals.	170 3 4
	£1,251 7 18
Law expenses, deed stamps, &c.	7 19 8
Bad debts.	2,021 15 0
Balance carried to profit and loss account.	28,808 19 10
	£90,202 7 7

Cr.—Revenue Account

Sale of gas—	
Gas per meter to private consumers.	£26,506 11 0
Gas for public lamps.	5,653 19 11
	£32,160 9 11
Less discount.	18,501 8 8
	£13,659 1 3
Residual products—	
Coke (less labour, £227 17s. 4d.).	£4,650 9 11
Lime and ferric oxide.	144 17 8
Tar.	3,621 9 4
Ammoniacal liquor.	5,104 6 9
	13,505 3 8
Rental of mains.	51 11
Rents of cottages, &c.	808 16 11
Services, meters, &c.	2,877 19 10
	£39,202 7 7

In the appendices to the accounts, interesting information is given as to the number of the consumers added, and the sizes of meters fixed, in the different months of the past year; as to the mains laid and taken up during the same period; as to the gas manufactured and consumed from July 31, 1853, to March 25, 1880; and as to the gross profit made, and the mode of its appropriation, from 1875 to the present year.

A CORPORATION OFFICIAL CONVICTED OF EMBEZZLEMENT.—At the Manchester Summer Assizes last week, Frederic Hepton, aged 40, late chief clerk and cashier in the Water-Works Department of the Corporation, was charged with having embezzled on the 24th of March last and other days, various sums of money amounting in all to nearly £3000, the property of his employers. After a protracted trial, the prisoner was found guilty, and sentenced to ten years penal servitude.

GLASGOW CORPORATION GAS AND WATER SUPPLY.

Mr. W. West Watson, F.R.S., the City Chamberlain of Glasgow, in his report upon "The Vital, Social, and Economic Condition of Glasgow for 1879," speaking of the Gas Committee and the Water Commission, says: "Each of these Trusts has, during the past year, pursued the equal tenor of its way, and its history has presented no novel or interesting feature to record, although a few dry statistical facts regarding the progress of each are given below:—"

GAS COMMITTEE.

The supply of gas continues to be most satisfactory, and it greatly exceeds the limit of illuminating power prescribed by the statute, yet the price has been reduced to 8s. 10d. per 1000 cubic feet. 21,000 yards, or something over 12 miles of new mains have been laid during the year, and the number of meters in use in the middle of the year was 132,054. These are the property of the Committee, and they are furnished without charge to the consumers.

Some time since, the Corporation authorized a connection by a 24-inch main-pipe between the Partick district and the great Dawsholm works. That is now completed, and the Partick Gas-Works being thereby rendered unnecessary, the ground which they occupy, and the whole machinery and plant, are now to be disposed of by the Committee.

The producing power of the gas-works is 1,300,000 cubic feet per day, and one very dark day in the winter of 1878-79 actually taxed their powers to the extent of 1,955,000, but that was a rare and most exceptional occurrence.

The following table exhibits the quantity of gas manufactured during each of the last 14 years; of course, however, the whole of this did not pass into consumption, as there is an unavoidable loss from leakage and other contingencies, even atmospheric, which no ingenuity has yet succeeded in overcoming:—

Quantity of Gas Manufactured in Glasgow during the Years from 1832 to 1879.

Year.	Quantity of Gas made, in Cubic Feet.	Year.	Quantity of Gas made, in Cubic Feet.
1832	100,008,300	1867	1,119,942,000
1837	162,605,800	1872	1,559,192,000
1842	198,322,500	1875	1,649,616,000
1847	391,353,000	1876	1,738,376,000
1852	505,285,000	1877	1,817,163,000
1857	697,378,000	1878	1,777,846,000
1862	829,849,000	1879	1,839,678,000

The following reports, dated in the middle and at the end of 1879, exhibit the illuminating power of the gas as supplied at these dates:—

	Illuminating Power, Average.	No. of Dye Candles.	Average below 25° Temperature of the Gas.	Average Barometric Pressure.
Northern and Western Districts	June 29-73	June 0	June 61°	June 29-41
Ditto	Dec. 26-93	Dec. 0	Dec. 57°	Dec. 29-98
Central and Eastern Districts	June 27-78	June 0	June 62°	June 29-45
Ditto	Dec. 26-93	Dec. 0	Dec. 56°	Dec. 30-03
Southern Districts	June 27-92	June 0	June 62°	June 29-50
Ditto	Dec. 25-93	Dec. 0	Dec. 49°	Dec. 30-08

WATER COMMISSION.

The total revenue for last year amounted to	£140,578 11 6
The total revenue for preceding year amounted to	139,282 8 10
Showing an increase, in comparison with the preceding year, of	£2,296 2 8
The total expenditure for last year, exclusive of the sum carried to the sinking-fund, was	£125,728 11 0
The total expenditure for preceding year	115,450 3 9
Showing an increase, in comparison with the preceding year, of	£10,278 7 8
But the actual gain upon last year's account was	£14,850 0 6
And there was carried to the sinking-fund account	15,096 2 2
Leaving against the revenue of the year	£246 1 8

The rates levied were unchanged, viz.:—Domestic rate within the City and Royal Burgh of Glasgow, being the rate of compulsory supply, 8s. in the £1; the public water-rate within the same limits, 1d. in the £1. The domestic water-rate beyond the limits of compulsory supply has remained, as before, at 1ld. in the £1. The rates for other than domestic purposes are charged according to a published table.

The quality of this water remains unassailable, and it is needless, year after year, to offer an analysis of what is on all hands admitted to be one of the purest waters in the kingdom, if not, indeed, the very purest. Suffice it to say, that upon Dec. 15, not the most favourable season of the year, there were found in 100,000 parts, only 3 parts of solid matter, and the amount of hardness—i.e., soap-destroying ingredients—amounted to only 100,000 parts, while almost all the waters used in London contain above 20 parts of hardness and 30 to 35 parts of solid matters.

The supply continues undiminished, and is greater than sufficient to meet all demands. During the past year the quantity sent into the city and district averaged 37,636,265 gallons a day, and of these there came—

From the Loch Katrine works	34,236,595
From the Gorbals works	3,413,350

showing an increase of no fewer than 3,623,508 gallons daily over the quantity supplied in the immediately preceding year. An idea of the magnitude of the demand and supply may be gathered from the fact, that during the past year no fewer than 12 miles of new pipes have been laid down, with the view of improving and increasing the supply to the city and district.

DERBY WATER-WORKS COMPANY.—What was expected to be the final meeting of this Company was held on Thursday, the 1st inst.—Mr. G. Gascoyne in the chair—when an interim dividend of 63 per cent. on the shares of the Company for the half year ending Dec. 31, 1879, was declared. As it had been found impossible to get in all accounts due to the Company, and discharge the debts owing by them, it was resolved to adjourn the meeting till Oct. 1, "for the purpose of receiving a final statement of the Company's accounts, and settling the dividend, and of a cash remaining in hand after all the Company's liabilities have been discharged, and to transact any other business connected with the winding up of the Company." The Directors were given their fees, as previously, for their labours in regard to the dissolution of the Company; and a vote of thanks to them for their services was passed.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Extreme depression prevails throughout the coal trade of this district, and colliery proprietors, to move away their surplus supplies, are compelled to quote very low figures to secure orders. So little confidence is there in any early revival in trade, that in some cases pits are being closed altogether for the present, and the willingness displayed to contract for long forward deliveries at low prices is a further indication that there is little probability of the demand overhauling the production for some time to come. This feeling in the market is particularly noticeable so far as gas coal contracts are concerned, and offers for long forward delivery are so freely made that buyers in most cases are able to confine their selections for contracts to tenders extending over three years. This, indeed, is the only basis upon which many of the gas coal consumers will entertain tenders, whilst, so far as prices are concerned, there are offered lower figures than have been known for years past, screened gas coal being offered for delivery equal to Manchester at as low as 7s. per ton, and canal from the Midland Counties at as low as 9s. per ton. These, of course, are exceptional prices, but there is no difficulty in obtaining good screened Lancashire coal delivered to the Manchester district at from 7s. 6d. to 8s. per ton. For other descriptions of round coal there is very little doing. In house fire qualities the demand is extremely small, and common classes for steam and iron-making purposes are only in limited request. The better qualities of round coal for house fire purposes can be bought in quantities at the present time at from 4s. 6d. to 5s. 6d. per ton; seconds at from 5s. 6d. to 6s.; and common coal at from 6s. 6d. to 6s. per ton. For engine classes of fuel there is a fair demand, but supplies, as a rule, are plentiful. For burgy, which only meets with a dull sale, 3s. 8d. to 4s. 5d. is quoted, but good slack is generally firm at from 3s. 3d. to 3s. 9d. per ton.

The shipping trade is very dull, and steam coal delivered either at Garston or Liverpool is pressed for sale at about 6s. per ton.

In the iron trade there is no large amount of business doing, but prices are firm, with an upward tendency, so far as pig iron is concerned. Lancashire pig iron, of the best quality, has been under prices for some time. Cleveland iron in this district, have, as a consequence, been able to book orders which would otherwise have gone to the North, and they are now asking higher figures: No. 3 foundry, delivered equal to Manchester, being this week quoted at 50s. less 2½, and forge at about 49s. per ton. Finished iron, of the best quality, is in demand, and is being sold at 40s. per ton. Manchester district at under 46 per ton; but more inquiries are reported, and there is, if anything, less disposition to quote under list rates.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade, following the line of improvement manifested in the sister industry, is now beginning to show somewhat more active than has been the case during the last few months. As in the case of the North, it is stated to be probable, the upward tendency of the iron market has in a great measure affected the autumn prospects of local colliery proprietors, and they are now asked for quotations in bulk for forward delivery of all kinds of iron-making fuel. The animated state that prevailed at the recent meeting of the district has been very much aided by the fact that, already led to the placing of several good contracts for terms extending as far as the end of the year. At Wolverhampton on Wednesday, and at Birmingham on Thursday, several lots were booked at recent rates. The consequence, however, was a general stiffening of prices, and one buyer who sought to place an order for 15,000 tons of furnace coal was unsuccessful. Coal for both furnace and forge consumption, as also slack and raskings, are now in fair request, and cannot be purchased at the rates existing a month ago. Furnace coal, though to be had in small lots at some of the local pits, at prices as low as 8s. per ton, cannot be obtained in quantity from the best collieries under 9s. 6d. per ton, and coal keeps in steady request, and house coal is more inquired after since the improvement in value of manufacturing qualities. In Cannock Chase deep coal a brisk trade is being done, and most of the pits are making a good output. Prices now ruling for this latter quality are 12s. to 13s. per ton.

Manufacturers of iron of both raw and finished qualities are now experiencing a decided alteration for the better. The foreshadowing of improvement apparent at the quarterly meetings of the ironmasters has continued to develop since, and both mills and forges are in a considerably more active state, while the progress of the decline of pig-making furnaces, which steadily set in at the close of the first quarter of the year, has not only been arrested, but a reaction has set in, and during the last week operations of blowing in were commenced in two or three parts of the district. Rates are gradually rising again, and though the standard quotation of 49s. for marked basins is still unaltered, it is considered that a few days time will see a change in this direction. Unmarked iron is rising, and several qualities have gone up 5s. and 7s. 6d. per ton within the last 14 days. In many cases makers refuse to book orders of considerable quantities, except at a further advance. Pig iron is in fairly active request, more especially local productions. Stocks have been cleared out, and parcels of Derby, Northamptonshire, and other brands are purchased in the district, also at rising rates. Indeed, all kinds of foreign pigs are steadier. Middlesbrough g.m.b. being 42s. and 43s. for No. 4 forge, f.o.t. West Coast hematites are at present offered at 75s.; hot-air pigs realize 43 15s.; and part-nine, 43 to 47s. 6d. Common cinder quotations are 29s. 6d. of the best quality, and 28s. 6d. of under quality. Hot-air pigs at 46 15s. and 47. Puddlers bars have risen 2s. 6d., and sheets have gone up all round 5s., 7s. 6d., and 10s. over the prices of a week ago. Galvanized qualities have been advanced as much as 20s. in the week, and buyers are still anxious to transact business. Boiler plates, girders, angles, and tees are also in demand, but rates have advanced but little. In most of these kinds of finished iron, business has been brisk, and the transactions of a respectable character.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The state of the iron trade is all but unaltered, all departments being not over well off for orders. Some of the large firms where specialities are produced, including gas and water pipes and gas apparatus, are faring better than those places where ordinary castings and colliery work are chiefly manufactured. There is very little change to note with respect to the make of pig iron, and although business in this respect is not a short time ago, the output is kept up. With few exceptions, the works devoted to the make of Bessemer steel rails and tigers are kept fairly going; but engineering branches and railway wagon builders are by no means well off for work.

The position of the coal trade varies a good deal, owing to some of the pits being good contractors on hand, whilst others are scarcely able to find two or three days work per week for their operatives. Some of the pits in the West Yorkshire district, where a good quantity of steam coal is raised, are doing a fair business; but on the whole trade is not only flat, but prices are remarkably low and unprofitable. From Sharlston and St.

John's collieries a fair tonnage of house coal was last month sent to London by rail, and a good quantity of hard coal to Goole for exportation. Some of the West Yorkshire thin-seam pits are doing a tolerable business in coal for manufacturing purposes.

The South Yorkshire collieries producing house coal are sending scarcely an average tonnage to the Metropolis by rail, owing to the high carriage rates demanded by the railway companies. Seeing that the Great Northern Company declined to make any concessions, attention has been called to a scheme for carrying coal from the district *via* Boston Deep to London and Paris, and it is said that a limited liability company is being formed, with a capital of £1,000,000, with power to increase. The Company is to be known as "The Seaborne Coal and Wood Company, Limited." The coal is to be conveyed in sacks holding two hundred-weight, and a great saving in carriage rates is promised. At the present juncture coalowners here will look with great interest on the movement, as they declare they are practically shut out of the London market.

The steam coal trade so extensively carried on in the southern part of the coal-field is brisk, the whole of the collieries connected with the Steam Coalowners Association having orders for all they can raise. This quality of coal is, however, found with the house coal, and hence the difficulty of stocking the coal and exporting the other. The Manchester, Sheffield, and Lincolnshire and the Midland Railway Companies are carrying a large tonnage to the Humber ports, where the exports of late have kept up very well. There is, however, scarcely so much demand for hard coal for smelting purposes.

Prices of coke are well supplied with orders. This in a great measure arises from the increase which has of late years taken place in the production of coke in South Yorkshire, and to the quietness which prevails in some of the iron-smelting districts, one firm in North Lincolnshire having already dumped down two out of four furnaces in blast. The restriction of output is also proceeding rapidly, and it is feared that many of them will have to remain idle even when they are finished.

The wages question is beginning to be brought before the men, and at several places notices to quit their employment have been served upon employers engaged during the last year, and the matter submitted to a reduction rather than contest the matter with the owners.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There has been a somewhat increased demand for Durham gas coals over the past fortnight. A considerable amount of steam tonnage has been taken up to carry gas coals on to Cronstadt and some of the other larger ports in the Upper Baltic. The great gas-works at St. Petersburg, Moscow, and other large cities, are commencing to improve their stocks. A great good business is also doing in the Baltic.

The present somewhat low rate of freights encourages the gas companies to lay in supplies. A fair amount of business is also doing in the home trades. Generally speaking, the gas coal trade is pretty steady. Best steam coals have also come more into demand. In fact, the shipments of coals at the docks have been a little more brisk than in the previous two weeks. The largest business is doing in best coals, but there is a considerable amount of competition amongst seconds. There is no alteration in prices in any sorts. Coke is selling better, but the manufacturers are unable to secure an advance in rates.

The freight market may be expected to rise a little from this time until the end of September or the middle of October. But even this very much depends on circumstances. Seaborne coal of all descriptions has to sustain a very keen competition with railways in all the home markets. This has become so severe that even small sailing-vessels of from five to ten keels have been unable to find profitable employment over the past three months. And at present there is scarcely any business for them on order which will pay. An odd steamer or two pick up now and then a freight to London at about 8s. 10½d per ton; but nine-tenths of the carrying trade thence is done by the colliery steamers or by boats belonging to the collieries. It is not probable that the carrying trade will improve in the autumn or not; they could not be lower than they are at present.

The manufacturing trade of these districts is, if anything, better, and the iron market has been stronger over the fortnight; this has reacted favourably upon the trade in pig-iron, and there have been more in demand, and prices have advanced 2 or 3 per cent. all round in this trade. Fire-clay goods of the very best sorts still show good shipments; but second class still fall off in demand. The timber trade is without change. Lead is a little lower in price, but other metals keep pretty firm. There have been no very heavy orders for water pipes abroad lately; but sanitary pipes show continued large exports.

INCREASE IN THE RATEABLE VALUE OF THE CAMBRIDGE GAS AND WATER COMPANIES UNDERTAKING.—The Cambridge Urban Assessment Committee recently called in a professional assessor to estimate the value of the Gas and Water Companies property for rating purposes. Comparing the value this year with what it was in 1870, it is said the amount is raised from £211 gross rental, £2900 rateable value, in the case of the Gas Company, to £2670 gross rental, £4519 rateable value; and for the Water Company, from £150 and £300 to £300 and £400 respectively.

PROPOSED EXHIBITION OF GAS APPARATUS IN DUBLIN.—Last week we noticed the project by the Belfast Corporation Gas Committee to hold an exhibition of gas apparatus next month, and to-day we publish an advertisement announcing that the Alliance and Dublin Consumers Gas Company intend having a similar exhibition of gas engines, cooking-stoves, heating and ventilating apparatus, burners, and chemicals in connection with gas manufacture—from the 6th to the 18th of September. The date of this exhibition has been so arranged that exhibitors at Belfast will have time to send their goods on to Dublin, and then to Glasgow for the 28th of September, if they wish to do so.

SALICIOUS GAS COMPANY.—The annual general meeting of this Company was held on the 7th inst., when the accounts for the year ended April 30 last, were presented. They show that the consumption of gas by private consumers during the year amounted to 4,265,700 cubic feet, worth at 6s. per 1000 feet bright revenue of £1038 15s. 7d.; the residual products realizing £109 5s. 7d. The expenditure, including coals and cartage, was £288 18s. 8d., which was equal to 1s. 1½d. per 1000 feet of gas made; the total ordinary expenditure being £716 18s. 1d., equal to 2s. 10d. per 1000 feet of gas made. The abstract of Coal Account and Product of Gas, appended to the accounts, shows that during the year 537 tons 7 cwt. of coal and shale were used, estimated to produce 4,377,725 cubic feet of gas. The actual quantity made, as indicated by the station-meter, was 5,053,000 feet, equal to rather over 9066 feet per ton. The gas used by consumers amounted to 4,265,700 cubic feet; used in 54 street-lamps, which are supplied free of charge; used on works, &c., 35,000 feet; 13,000 feet, thus leaving unaccounted for, 592,805 cubic feet, or 11½ per cent. of the make. The accounts were approved of, and a dividend of 10 per cent. was declared. It was agreed to reduce the price of gas from 5s. to 4s. 7d. per 1000 from the 1st of May last.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

At a recent meeting of the Directors of the Dysart Gaslight Company, the price of gas was reduced 6d. per 1000 feet—from 6s. 3d. to 5s. 10d. At the next meeting of the Dundee Gaslight Gas Committee was held on Monday, the 12th inst., when it was unanimously agreed to reduce the price of gas from 6s. 8d. to 6s. 3d. per 1000 cubic feet for the next six months.

A dividend of 8 per cent. was declared at the annual meeting of Shareholders of the Markinch Gaslight Company, held on the 19th inst. For many years the dividend was 10 per cent., but during last year many important improvements were carried out at the works, thereby making the expenditure greater than usual. The street-lamps are supplied by the Company free of charge. Mr. D. Watson was appointed Treasurer, in room of Mr. J. Foote, deceased. All the retiring Directors were re-elected.

The Corporation Gas Commissioners of Arbroath had their annual accounts under consideration at a meeting held on Monday last week. The accounts showed that there was a surplus profit on the year's working amounting to £767 8s. 8d., as against £740 7s. 6d. in 1879, and that of the previous year. In its annual report for the year ending May 30, 1880, the Manager (Mr. D. Terrace) stated that the quantity of coal consumed during the year was 3659 tons, as against 3308 tons in the year 1878-79, being an increase of 251 tons, or 7½ per cent. The make of gas was 37,697,000 cubic feet, or 2½ millions more than in the previous year, or an increased output of 7½ per cent. The amount of gas sold per ton was 10,599 cubic feet, as against 10,599 cubic feet, while the gas sold per ton was 9345 cubic feet, or about the same quantity as in the year 1878-79. During the past year the unaccounted-for gas was 11½ per cent. of the quantity, as compared with 12½ per cent. in the previous year, the reduction being 0.87 per cent. The quantity of gas sold per ton was 10,599 cubic feet, as against 10,599 cubic feet. About five years ago it was between 17 and 18 per cent., so that there has been a saving on this head of at least £400 per annum. After a long discussion it was resolved by a majority of 10 to 4 to approve of the recommendation made by the Committee of Management—namely, to continue the present rate of 5s. per 1000 feet, with a rebate or discount of 2½d., making the rate equal to 4s. 7½d. per 1000 feet; and to pay over one-half of the surplus profits as usual to the Town Council, for public improvements. The minority were in favour of the price being reduced to 5s., and a decided opinion was expressed that the gas supply undertaking should stand by itself, all the profits being spent in reducing the price of gas.

A reduction of 5d. per 1000 cubic feet has been made in the price of gas by the Broughty Ferry Police Commissioners, the charge for the current year being 4s. 2d. per 1000 cubic feet, with the usual 5 per cent. discount for prompt payment. The Gas Committee have purchased their coal this year at a reduction of something like 2s. 8d. per ton, giving a saving equal to about £200. It is very creditable to the Manager, Mr. Myers, that he has been able to reduce the item of unaccounted-for gas from 16 to 9½ per cent., which is certainly well-nigh the lowest percentage of leakage of any town gas supply in the country. The Gas Committee, Mr. Scott, says, he believes it to be, without exception, the lowest.

In regard to the contemplated transfer of the gas supply undertaking of Coupar Angus to the Police Commissioners of the burgh, it was intimated by the Clerk, at a meeting of the Commissioners held on Monday, the 12th inst., that the Clerk of the Council of the burgh, Mr. J. G. Macdonald, had stated that the latter had stated that he had no power to call a meeting of the Directors for the purpose of negotiating on the subject. It would seem, therefore, that there is but little prospect of the adoption of the Gas Act in the meantime.

In consequence of the resolution of the Forfar Gas Corporation to apply to Parliament for additional borrowing powers to the extent of £4000, an inquiry, at the instance of the Home Secretary, took place last Wednesday, before Sheriff Robertson. Mr. Gordon, Clerk to the Commission; Mr. M. Hardy, Treasurer; Bailie Laird, Convener; and Mr. D. B. Esplin, Manager, gave evidence. The Home Secretary asked the Clerk to extend the manufacturing power, the extensions to meet which had rendered the present application necessary, the Corporation having already exhausted the sum which they were empowered to borrow under their Act. No opposition was made to the petition. The Sheriff explained that all he had to do was to take such evidence as was tendered to him, and to report thereon. His lordship's report was transmitted to the Home Office the following day.

The annual general meeting of the Laurencekirk Gas Company was held last Wednesday—Mr. D. A. Pearson presiding. A balance-sheet was submitted, which showed that the net dividend of 7 per cent. could be paid, and that the balance of the profits was £1000. Satisfaction was expressed by the meeting with the state of the Company's affairs, and it was agreed to pay the dividend recommended by the Directors.

At the last meeting of the Town Council of Aberdeen, Bailie Macdonald, speaking with reference to the acceptance by the Gas Committee of tenders to the extent of 24,000 tons of coal at a total cost of £21,775, said there would be a saving of £550 on the contracts for coal this year. Under the able convenship of Bailie Donald, the price of gas had been reduced to 4s. 2d. per 1000 feet. He believed their gas would now be the cheapest in the country, taking into account the difference of the price of carriage of the coal from the pit mouth, and the fact that the gas was of the best quality.

The first statement of accounts of the Town Council of Peterhead, acting as Gas Commissioners under the Burghs Gas Supply (Scotland) Act, 1876, was recently issued. It applies to the period from Nov. 23, 1879, to Nov. 23, 1880. The total quantity of gas supplied during the year was 4,265,700 cubic feet, worth at 6s. per 1000 feet bright revenue of £1038 15s. 7d.; the residual products realizing £109 5s. 7d. The expenditure, including coals and cartage, was £288 18s. 8d., which was equal to 1s. 1½d. per 1000 feet of gas made; the total ordinary expenditure being £716 18s. 1d., equal to 2s. 10d. per 1000 feet of gas made. The abstract of Coal Account and Product of Gas, appended to the accounts, shows that during the year 537 tons 7 cwt. of coal and shale were used, estimated to produce 4,377,725 cubic feet of gas. The actual quantity made, as indicated by the station-meter, was 5,053,000 feet, equal to rather over 9066 feet per ton. The gas used by consumers amounted to 4,265,700 cubic feet; used in 54 street-lamps, which are supplied free of charge; used on works, &c., 35,000 feet; 13,000 feet, thus leaving unaccounted for, 592,805 cubic feet, or 11½ per cent. of the make. The accounts were approved of, and a dividend of 5 per cent. was declared. Thereafter the meeting elected the following Directors:—Messrs. W. Goudie, J. Graham, J. McCracken, and W. Howie.

It has just been reported to the Police Commissioners of Inverness by the Town Chamberlain, that the profit on the gas supply undertaking for the past year amounted to nearly £300, and justified the recommendation that the price of gas should be reduced from 7s. 6d. to 6s. 8d. per 1000 cubic feet.

A dividend of 10 per cent. has been declared on the profits of the past year by the Lerwick Gaslight Company, and a reduction of 1s. 8d. per 1000 feet has been made on the price of the gas.

The annual general meeting of the Girvan Gas Company was held on Thursday, the 8th inst. After some consideration, the report issued by the Directors was unanimously adopted, and a dividend of 5 per cent. was declared. Thereafter the meeting elected the following Directors:—Messrs. W. Goudie, J. Graham, J. McCracken, and W. Howie.

LAST Saturday's Citizen, in reference to the Municipality of London Bill, says: "We are informed, on the highest authority, that one particular member of the Cabinet whose opinions upon Municipal Government, founded upon a large personal experience, would naturally have the most weight with his colleagues, is decidedly favourable to the creation of municipalities in the various parliamentary boroughs of the Metropolis, with a Joint Committee, presided over by the Lord Mayor, and for all matters equally affecting the whole, such as main drainage, gas, and water. If this be so, why does not the Corporation seize the favourable opportunity, and draft a Bill founded on those lines? or so effectually supersede all future attempts at grasping with this large subject, which many think are sure to meet the same end as that which the House—it is said, scornfully, but as we think, very improperly—declined even to consider on Tuesday last."

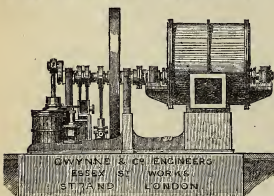
BOSTON GAS COMPANY.—At the annual meeting of this Company recently held, the Directors report which was presented showed that the profits of the Company for the past year were £4520 12s., against £4705 15s. 2d. in the previous year. There was a decrease in the amount of gas consumed, both by householders and public companies. The report was adopted, and the full parliamentary dividend on both classes of shares was ordered to be paid. The report also recommended that the remainder of the Company's loan of £1500 should be paid off in January next, and this was agreed to. Messrs. Wren, Cooper, and Mawer, the retiring Directors, were re-elected. It was also agreed that in future an interim dividend of 4s and 3s per cent. be paid, on the 1st of March annually, on both classes of the Company's shares. Some discussion took place as to whether the price of gas to private consumers should not be reduced, but the prevailing opinion of the meeting was that the Company should first clear themselves of their liabilities.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

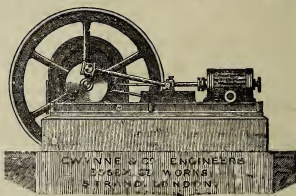
- 2666.—**DAVEY**, G. W., Barking, Essex, "Improvements in the distillation of coal tar, and in the apparatus employed therein." June 29, 1880.
 2679.—**SCHLOSSER**, R., Manchester, "Improvements in the construction of water-meters." A communication. June 30, 1880.
 2683.—**LARK**, W. B., Southampton Buildings, London, "Improvements in pumps." A communication. June 30, 1880.

THE GRAND MEDAL OF MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

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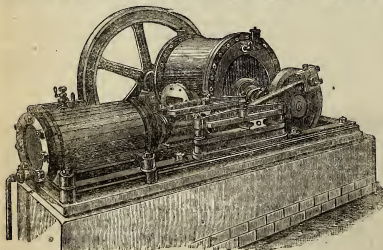
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TO SUBSCRIBERS.

BANK HOLIDAY.—In consequence of the Bank Holiday next week, the JOURNAL will not be published till Wednesday, Aug. 4.

Subscribers who desire to avail themselves of the reduction in the subscription to the JOURNAL, by paying in advance for the second half of the year 1880, are reminded that this can only be done during the present month.

Subscribers who have not paid their subscriptions for this, or for any previous year, are requested to remit the same forthwith to the Publisher, in order to prevent any interruption in the regular delivery of the JOURNAL.

TO CORRESPONDENTS.

We are compelled to hold over again this week several interesting items of news which have been sent us by correspondents and others.

D. C. NIXON.—Your letter must stand over till next week.

ONE ANXIOUS.—Too late for notice or insertion this week.

THE RESPONSIBILITY FOR THE SAFETY OF HIRED METERS.—In reference to the answer in last week's issue to our correspondent "W. B.," Mr. Magnus Olven, the Secretary of the Crystal Palace District Gas Company, sends a copy of the rules and regulations signed by each consumer of gas in the Company's district, one of which—the following—saves the Company from loss of, or damage to their meters:—"The Company will provide meters at rent, and keep them in repair; the consumer, however, being responsible for the safety of the meter, and liable for any damage it may sustain from fire, or other accidents, or from carelessness." The case which "W. B." stated was one, we may say, "without any special agreement, but on the usual understanding that the cost of repairs was included in the hire."

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 27, 1880.

Circular to Gas Companies.

M. JORDAN'S Inaugural Address to the members of the Société Technique de l'Industrie du Gaz en France, which was briefly noticed in our last week's issue, affords matter for more extended comment than we were then able to find room for. Noticeable among the business topics dealt with by the President was the list of donations by various Gas Companies and gas-works proprietors, in aid of the funds of the Société, amounting in all to 9925 frs. (nearly £400), which goes to show the appreciation in the circle the useful work of the Société is held by those who primarily benefit by the advancement of its members in technical knowledge. It should be stated also that no inconsiderable portion of the

funds of the Société is absorbed by the premiums offered yearly for written contributions; the first premium, of 1000 frs. (£40) having this year been awarded to MM. Monnier and Thibaudet, for a paper on the construction of a telescopic gasholder, which we hope to present to our readers on an early date; and the minor prizes were awarded to MM. Brémont, Coze, and Ellissen for papers on the effect of atmospheric rarefaction on the illuminating power of gas, and on "intensive" burners. The Société also offers prizes of 200 frs. (£8) to workmen employed in gas-works, for long service and good conduct, three veterans being rewarded in this way at the last congress.

The President was able to announce with considerable satisfaction that the French railway authorities had for the first time issued tickets at reduced fares to members of the Société attending the congress—a graceful concession, which it would be too much to expect our English Railway Companies to imitate.

M. Jordan, in the course of his general remarks, reflected strongly on the presumption of those enthusiastic amateurs who have made themselves so prominent of late, on both sides of the Channel, by the virulence with which they have attacked the present system of gas illumination; and, without taking the trouble to master the rudiments of the art, have sneered persistently at gas engineers and managers, as ignorant bunglers needing to be swept aside—or, to use their favourite expression, superseded, by electricity or something else, of course under the direction of the said reformers or their friends. M. Jordan stated a well-known source of some of this revolutionary ardour in his reference to the common practice of disappointed inventors, who, failing to secure attention to their often crude proposals, instantly revile the obstinate gas manager, whom they have attempted to enlist into their enterprise, and from that time lose no opportunity of uttering damaging statements respecting gas and all its belongings, to any one who will listen to them. M. Jordan is in perfect union with Mr. Hunt, in that portion of the address lately delivered before the members of the British Association of Gas Managers, in which the necessity of the co-operation of gas producer with gas consumer was weightily set forth. Much of the observed readiness of the public to listen to any blatant denunciation of Gas Companies is referable to the antagonism which an ill-considered system of regulations, restrictions, and petty evidences of distrust has in too many instances aroused in the relations between the seller and the purchaser of this particular commodity. It is time that the nature of the monopoly enjoyed by the manufacturers of gas in the localities where their operations are carried on should be clearly understood by both parties, and to this end the efforts of the manufacturers who enjoy this protection should be carefully directed. The more it is made manifest that the monopoly exists mainly in the interests of the consumers, and that only those regulations absolutely necessary for their own protection are enforced under the exceptional powers enjoyed by the manufacturers, so much the less readily will the public run after strange lights, and appreciate more fully the benefit which gas confers on a community, and which no other known means of artificial lighting can be shown to possess.

M. Jordan referred to the spread of gas-motors during the last few years, and while recognizing their utility and economy in working, even under present circumstances, he drew attention to the high prices at which the best machines of this kind are now sold, regretting that their extended adoption is not to be expected while their first cost remains so prohibitive. This is, however, a matter which time will cure. The unparalleled success of these motors is arousing wide competition among machinists, and the result cannot but be advantageous to the public.

On the whole, M. Jordan may be said to have concerned himself principally with the aspect presented by gas undertakings to the public generally; and, therefore, his address is of wider interest than the majority of such utterances. Such, being the case, its comparative dearth of technical matter may be excused. M. Jordan did not pretend to instruct his hearers on the subject of their daily experiences, but he rather aspired to act as their good-natured friend, telling them, as a business man, what their status really is in the eye of a critical public, and at the same time acting as their advocate when necessary. He did not flatter them, and he would not allow anybody else to abuse them; so, on the whole, he must have left them tolerably well satisfied with themselves, and particularly well pleased with their President.

There are not wanting indications that the electric light will supplant the great sea-serpent and the gigantic goose-

berry as interesting material for the daily press during the imminent "silly" season. The competitive trial about to take place in Paris, when several of the most celebrated varieties of the luminous are and incandescent electric lamps will be shown in operation at the Opéra, and the threatened action of the Commissioners of Sewers of the City of London in the same direction, respecting which we have recently expressed an opinion, will offer abundant scope for any number of lurid leaders and graphic letters from special correspondents, and we may be assured that it will not be the fault of those indefatigable purveyors of exciting intelligence to the great British Public if another gas scare fails to arise. The *Standard* is the first in the field this time with a long account of the newest forms in which our old acquaintance, the magneto-electric light, is about to appear before the world on the grand scale to which we have already referred; and as, in the opinion of our contemporary, a crisis in the history of the light will shortly be reached, it will be as well to examine a few of the particulars that are given respecting its present condition and prospects—at least, as they are published by the inventors of the respective systems which are most actively bidding for public support—in order that we may form some sort of judgment, however imperfect, of the progress which has been made in the means of producing, distributing, or regulating the light, since it last enjoyed the perilous honour of forming a stock subject of controversy and speculation.

We need not enter into details respecting the Jablochkoff candle arrangement, which has been described and puffed *ad nauseam*. Suffice it to say that some economy is found practicable in the branch wires which connect the lamps with the main conductor, and an improvement has been made in the arrangements for changing the candles, which has still to be done every two hours, or rather less. In other respects this method of lighting has retained its original peculiarities. A newer aspirant for public favour is the Jamin light, which is developed from vertical sticks of carbon burnt from the lower end, thus reversing the usual order of things. The carbons are much cheaper than the Jablochkoff candles, and do not require attention so frequently. Great things are prophesied of this arrangement, which has been taken up by an influential French company, and we shall hope soon to see whether it will answer as well in England as it is alleged to have done across the Channel. The Brush system, which is one of those good things for which we are indebted to our American "cousins," has been making a great deal of headway in England, and apparently deservedly. For many of the peculiar conditions which the electric light fulfils better than any other luminant, this system will probably grow in favour. The Werdermann light, which in some respects seeks to rival gas in its own domain, has not attracted much attention of late. We are, however, informed that the inventor is about to make a fresh start under highly favourable auspices, when great things are to be achieved, but we must perforce defer judgment until we have had an opportunity of seeing some performance by which to gauge the value of these promises.

Now we have run through the list—not an extensive one by the way—of the principal methods of electric lighting which we shall probably hear most about in the course of the ensuing autumn, and our reflections thereon decidedly tend to strengthen the idea that gas property is not in any great danger from any one of them. It will be noticed that the various electric lamps, and the apparatus used in connection therewith, differ from each other merely in points of detail, and scarcely more than do the different kinds of gas-burners. But in all, the central characteristics remain the same, just as in the parallel example of gas, which possesses a certain distinctive nature whatever means are adopted for consuming it. Now, in the use of electricity as a means of producing light, certain peculiar effects have always been observed to accompany, and, in a certain sense, to qualify the light itself. These effects—such as a constant flickering, and a more or less definite pulsation, by which the illuminating power obtained is caused to vary through a considerable range, both of which, with the liability to even greater disturbance, are in a large measure referable to the direct dependence of the light on the power employed to generate the magneto-electric current, or, in other words, to the absence of any power of compensation from one moment to another—are quite outside the range of any improvements which have as yet been introduced by any of those inventors whose names we have mentioned, or indeed by any other electrician. In view of the interest, and possibly excitement, the re-appearance of the electric light in our thoroughfares is well calculated to arouse, it cannot be too widely known that there has been no striking change whatsoever in the character of the light itself, that all its well-

known imperfections remain as evident as before, and, consequently, that it would be worse than folly on the part of the owners of gas property to fall into any of the traps which will in all probability be laid for them if the favourable opportunity arises, and the public display any tendency to undergo another fit of electrical mania.

The Sutton, Southcoates, and Drypool Gas Company, which is one of three Gas Companies supplying the town of Hull, have been endeavouring, in the House of Lords, to prevent the Corporation acquiring the power to light the streets and public buildings of the town by electricity, but without success. The system of lighting which the Corporation desire to adopt is that of Dr. Siemens, which is calculated principally for highly concentrated lights, such as would be used for harbours, docks, &c. This one of the three Companies probably felt themselves particularly aggrieved by the proposal to use electricity for such purposes, from the circumstances of their own district, but it could not be contended on their behalf that Gas Companies have any monopoly of public lighting other than that constructively dependent on their power to break up the streets for laying pipes; and as, moreover, the Company did not come before the Committee with a very clean record, the prayer of their petition was disregarded, and the Corporation obtained the power they sought, which, among other things, includes the appropriation of £50,000 for the purpose of carrying out the necessary arrangements. This is a tolerably large capital to devote to what is really an experiment, although it was not expressly described as such; and we should like to know in this case, as in others, what is to compensate the ratepayers for their liability under the new Act. When large sums, as in some instances which might be named, are taken from gas consumers in aid of the rates, a common argument in justification is, that as the ratepayers are liable for the capital invested in the gas undertaking, they ought to be also considered in the appropriation of the profits. But in the present case, wherein the ratepayers risk is very appreciable, there is an express provision forbidding the Corporation making any profits at all. Truly, if in an advanced state of civilization legislation is to proceed on rational and uniform principles, the conflicting statutes of the present generation will afford our more favoured descendants amusement rather than instruction.

There was recently a severe parliamentary conflict over the Maidstone Gas Bill, in the course of which a great deal of evidence was offered on the part of the Corporation which was, to say the least, of a somewhat startling character, and such as, if it could be maintained, should have a material influence on future gas legislation. A new chapter in the history of gas purification from sulphur was opened by Mr. Hawksley, to whom we feel we should do an injustice by attempting to make extracts from his evidence, and we must therefore refer our readers for further information to the full report which appears in another column. Unfortunately the Committee on the Bill were not permitted the advantage of hearing Mr. Vernon Harcourt's opinion respecting Mr. Hawksley's method of doing, without trouble, nuisance, or expense, something which no other gas engineer in London or the provinces has as yet succeeded in doing with such approach to perfection; but, under the circumstances, it was probably considered that criticism or corroboration were alike superfluous.

Some time since the advisability of the purchase by the Local Board, of the undertaking of the Northwich Gas Company was seriously debated by the former body, and the result was that a Committee was appointed to treat with the Company as to terms and conditions. But after one interview had taken place between the parties, the Committee became frightened about the electric light, and concluded to stand aside and await the course of events. Gas having kept its ground, and the Company having written twice to inquire what the Committee were doing, the subject was mentioned again at the last meeting of the Board, when a resolution ordering the negotiations to be commenced anew, was carried after much desultory discussion. The usual accusations of arbitrary action and indifference to the wishes of the public were made against the Company, which perhaps may be taken to mean that a little more courtesy might be expected from some of the officials, but this can hardly be considered sufficient reason for proceeding in a hostile spirit against the Company. It appears that the Chairman of the Committee himself had a grievance against the Company when he last waited on them, and in his case the mixture of private interests with public duty resulted disastrously to the former. Let us hope that nothing of this kind will occur again to influence the

attainment of a fair understanding between the contending parties when next they meet.

The Chester City Treasurer, Mr. J. E. Edwards, has just presented his report to the Town Council on the state of the Chester United Gas Company's accounts, which he was directed to audit. The returns show well for the Company, who have paid maximum dividends since 1875, and made contributions to the reserve-fund equal to one and a quarter per cent. on the stock and share capital. Up to the close of the year 1878 the total capital expenditure on the undertaking had been £89,474 11s. 2d., which, although certainly ample, can scarcely be called excessive, as hinted by the Treasurer, and the price of gas has been reduced ninepence per thousand feet since 1875. The Treasurer, however, advises that in the Company's new Act certain provisions should be inserted for the benefit of the town, such as a renewal of the power of the Corporation to purchase the works, a reduction in the maximum price of gas and the cost of the public lamps, and an increased illuminating power. No definite suggestions are made as to these several concessions, which will, if the report be adopted, form fit subjects for arrangement between the Council and the Company. There is no allegation of any lack of purity of the gas, or other default on the part of the Company, although such matters might not have come fairly within the scope of the Treasurer's inquiry. The report, on the whole, testifies to the consideration which the Company have shown to their customers, and this should be remembered when further restrictions are sought to be imposed upon them.

It is edifying to observe how the representative bodies of neighbouring districts love one another—especially if there should also happen to be any business relations between them. When a local authority has become possessed of a gas undertaking, for instance, which extends its business into another district, the differential rates which frequently exist in favour of the proprietary district form a very fruitful source of dissatisfaction, sometimes leading to open rupture. The Salford Gas Committee a short time since proposed to reduce the price of gas in the borough threepence per thousand feet, but in the outer region, including the parts watched over by the Barton and Swinton Local Boards, the reduction was to be one penny only. This arrangement, of course, struck the members of the latter bodies as being very unjust, while the Chairman of the Barton Local Board is reported to have said at a recent meeting that "in Salford they"—presumably the Gas Committee—"have no principle except to get as much as they can." We fear the allegation would apply to many other places and people besides the unfortunate victims of the Chairman's displeasure, and a cynic might even credit the same feeling with having originated the very expression which so emphatically condemned it.

The Winchester Town Council, apparently tired already of their experiment of lighting the streets with petroleum in place of the gas formerly used there, are turning their attention to the possibilities of electricity for use in that connection. A deputation from the Council recently came to London and made a thorough inspection of the Brush system, which it is thought they can use by appropriating for the purpose the steam-engine, plant, and buildings at the sewage pumping station. As anything that may result from the visit will not damage the Gas Company, who have for some time past lost the lighting of the public lamps, we may wish the Town Council joy of their enterprise.

Water and Sanitary Notes.

THE progress made with the London Water Supply inquiry has been somewhat slower than the pace we reckoned upon last week. The Select Committee met on Tuesday, and after deliberating with closed doors, for two hours, on the terms of their report, adjourned their proceedings for a week. In the meantime, a melancholy event has transpired in connection with the inquiry. Mr. Edmund James Smith, who was the principal witness before the Select Committee, died on Wednesday last, somewhat suddenly. Although the deceased gentleman was over sixty years of age, the event is a startling one, and much to be regretted. Sir Edmund Beckett may be congratulated on having vindicated Mr. Smith before the Committee, prior to this sad occurrence. The testimony given by Sir Edmund was generous and emphatic, and might be looked upon as compensating for the misapprehension and prejudice to which Mr. Smith had been subjected in respect to the negotiations for the purchase of the undertakings appertaining to the London Water Companies. "Everybody who has heard Mr. Smith's evidence," said Sir E. Beckett,

"and everybody who has parliamentary experience such as mine, will concur in this, at any rate—that no such exhibition of masterly calculation has ever been witnessed in these rooms, I can say, for thirty-six years. I have heard the late Mr. Bidder, who was a famous calculator; but there is more than calculation in this, and I have never heard such a masterly power of calculation, together with the policy and reason involved in the calculation, as Mr. Smith's." It may not be amiss to add a few words which followed. "Further, I have this to say," said Sir E. Beckett. "I doubt if even now a hundred people in London, outside of those who are obliged to attend to it and understand it, really understand this bargain." Sir Edmund acknowledged that until he was obliged to master the question, he did not himself understand the transaction. "I had read outcries in the newspapers about it," said the learned Counsel; "I had read outrageous figures showing I know not how many years purchase which the Companies were going to get, and I have read a lot of other enormities; and although I am not given to believe all that one reads in the newspapers, or to assume that newspaper editors know everything, still I confess that I have been 'taken in' for a while." It is to be feared, as Sir Edmund intimates, that there is still a general misconception as to the merits of the question. The figures are affected by the facts, and the facts are not realized, except by a very few. Mr. Smith was able to see both sides of the question, and time will probably show that he was far more correct in his judgment than those who criticized and denounced his conclusions. It is well that he lived to give his evidence, but his death at the present juncture is nevertheless a public loss.

Commenting on a passage of arms which took place in the London Water Supply Committee, between the Chairman and Sir E. Beckett, the *Evening Standard* last week compared Sir William Harcourt to "the fretful porcupine." The learned Counsel was defending the late Mr. E. J. Smith against the deprecatory remarks made by Mr. Michael, when "the genial and always agreeable Home Secretary" interposed by saying "he hardly thought that Sir Edmund Beckett could have taken the trouble to read the evidence." Our contemporary observes that it was Sir Edmund's duty to be familiar with the evidence, and there could be no doubt that he had taken proper pains to master the details. "Sir William Harcourt's sneer," it is remarked, "was none the less offensive on that account," and Sir Edmund Beckett is commended for his moderation in simply replying, "Indeed I have." The *Evening Standard*, referring to the incident, proceeds to say that, in response to this avowal, "Sir William Harcourt—the fretful porcupine—severely replied, 'Go on, and I expect you will treat us with respect.'" It is suggested that, "if Sir William Harcourt desires to be 'treated with respect,' it would not be by any means a bad idea if he began by showing some sort of respect for other people." We are glad to find our contemporary saying that Sir Edmund Beckett, in defending Mr. Smith, spoke "very much to the point." Unfortunately, it is not often that the daily press will allow anything to be good which appears on the side of the Water Companies.

The singular manner in which Sir W. Harcourt has regulated the proceedings of the Select Committee on the London Water Supply, as we noticed last week, has led to considerable perplexity among the civic authorities. At the meeting of the Commissioners of Sewers of the City of London last Tuesday, an animated debate took place as to whether or not the opportunity was past for bringing forward evidence concerning the rate of charge for the water supplied to warehouses and offices. Mr. Bedford, quoting from Sir W. Harcourt's remarks and from the speech of Sir E. Beckett, declared that the case of the City had been "thrown over utterly and entirely." "We went before the Committee of the House of Commons," said Mr. Bedford, "to protect the interests of the citizens, which have not been considered for one single minute. What we could have been about in employing Counsel to state the case of the City, and not one single allusion to be made by them to our great grievance, I cannot comprehend for the life of me." "We have been of no more use in the House of Commons Committee," continued Mr. Bedford, "than if we had gone to Salisbury Plain." We may suggest that perhaps Sir W. Harcourt was too good a lawyer to think the "great grievance" of the City to be of much value as a weapon of attack against the Companies. Hence he first requested the learned Counsel to limit themselves to a consideration of the agreements, and afterwards remarked that the City had brought forward no evidence as to the "basis of charge," neither had Mr. Michael referred to it in his address. Sir

William was clever, and as yet the Commissioners of Sewers are at a loss to know whom they are to blame. Some of the Commissioners, we observe, try to think that everything is right, and declare that Mr. Bedford is "dreaming." It is clear, however, that Sir W. Harcourt is sufficiently awake.

An article on the "The London Water Question," by Dr. Humphrey Sandwith, in the current number of the *British Quarterly Review*, asserts that "London continues to be supplied with diluted sewage water," though it is allowed that this "is perhaps good enough for washing the streets." Such statements will indicate at once to those of our readers who have not seen the dissertation itself, what kind of matter the article contains. Every possible charge that can be brought against the Water Supply of the Metropolis is raked up from the history of the past, no recognition being given to the fact that there is a marked difference between the supply as it existed some years back and at the present time. Yet to ignore the improvements which have been carried out by the London Water Companies in recent years, is to present a view of the subject which is altogether out of date. Dr. Sandwith also fails to show what is to be the remedy for the state of things which he deplors. "Long as our article is," he tells us, "we have by no means exhausted this most important subject." This is perfectly true, as the Doctor indicates when he goes on to say: "Very much might be written on the various plans suggested by engineers for supplying the Metropolis with fine spring water, or with pure rain water collected from the large surfaces of barren tracts, or from lakes in Wales or Westmoreland." Much might be said concerning these proposals, we have no doubt, but it is easier to find fault with things as they are than to demonstrate a practical remedy. These magnificent schemes will be found to have their drawbacks, and in the meantime the extension of the constant service is conferring, as it goes on, a substantial boon on the consumer. Dr. Sandwith only glances at this part of the question, and concludes by declaring "the necessity of an entire change of the source of the supply, and the urgent need of taking the administration of this 'necessity of life out of the hands of trading Companies.'" If the water supply were not in the hands of "trading Companies," perhaps there would be less agitation on this "most important subject."

The East Ham Local Board having asked the East London Water-Works Company to do something for which the Company's Act gives no authority, and the Company having, therefore, replied that they could not comply with the Board's request, the Clerk to the Local Board has been instructed to write to the Home Secretary on the matter, asking the Government "to grant additional powers to Local Boards, and prevent the Company overriding their decisions!"

Opposition to the Liverpool Corporation Water Bill was threatened in the House of Lords by the action of several large ratepayers, including members of the City Council. These parties presented a petition to the Upper House, praying to be heard by counsel against the preamble of the Bill. The petitioners objected to the leading features of the scheme—engineering, sanitary, and financial. They alleged there was no immediate necessity for an additional supply of water for the inhabitants of Liverpool, the present available sources being sufficient for the next fifteen or twenty years; and, further, that an abundant supply of water could be obtained within a district more accessible than the distant region of the River Vyrnwy. Another statement was, that when the ratepayers were polled on this question, the estimate for the scheme was £1,250,000, whereas the Bill empowers the Corporation to borrow £3,250,000. It was also objected that the scheme, if carried out, would be perilous to life and property, owing to the enormous quantity of water that would be stored in an elevated position. When the Bill came before the Lords last Thursday, Sir E. Beckett raised a preliminary objection to the *locus standi* of the petitioners, who, he contended, were only fourteen out of the seventy thousand ratepayers of Liverpool. After hearing the arguments, which lasted about two hours, the Committee decided against allowing the petitioners *locus standi*, and the Bill thus became practically an unopposed measure.

The extension works of the South Staffordshire Water-Works Company at Cannock were formally opened on Wednesday last, when a numerous party came together at the invitation of the Directors of the Company, many of the Local Authorities and gentry being present. After the inspection of the works, a luncheon was served, Mr. F. James, the Chairman of the Company, presiding. The Company have been carrying on their operations for now more than twenty years, the undertaking having been originated by the late Mr. J. R. McClean, M.P. The first sod of the Lichfield

reservoir was turned by Lord Ward in 1856, and the pumping-engines connected therewith were started in 1858. The works are now so much extended that although the district is one of immense area, the yield is far in excess of the present demand upon the Company's resources, and it rests with the Local Authorities of the contiguous towns to avail themselves of the ample supply placed at their disposal. The capital outlay of the Company at present amounts to £720,000, the extension works last completed having absorbed about £300,000. It is to be hoped that the Company will be rewarded for their enterprise, which hitherto has not brought them much in the shape of dividends. If the Local Authorities do their duty, the public and the Company will alike be benefited.

The transfer of the water supply of Stockton and Middlesbrough to the Local Authorities has by no means brightened the prospects of the consumers, financially or otherwise. Water is still taken from the Tees, and while more and better water is demanded, there seems very little chance of these requirements being met. A deficiency is not yet experienced, but the limit of the present supply is so nearly reached that it is deemed impossible to construct new works and introduce a fresh supply in time to meet the wants of the district. It is not likely that Parliament will authorize the pumping of more than 60 million gallons of water from the Tees, and when this limit is reached the situation threatens to be embarrassing. The new works that were to be constructed in order to introduce a pure supply, are said to be too costly to be undertaken at present, and yet they ought to be in progress. The Water Board, it is argued, must perforce seek for an enlarged and improved supply, but where this is to be obtained, and how it is to be paid for, are matters at present undetermined. The example is one which London may contemplate with advantage.

Viscount Midleton, in the House of Lords, recently called attention to the report of the Royal Commissioners on Noxious Vapours, and inquired whether or not there is a prospect of legislation in accordance with the recommendations given in that report. With the revival of trade, said the noble Viscount, noxious vapours were on the increase. Viscount Enfield, in reply, could only promise something "next year," and, of course, nothing more could be expected from him.

THE LATE MR. F. J. EVANS.

To look back through the professional life of the late Mr. Evans is to bring before the mind's eye the history of gas lighting during more than forty eventful years. In the course of this long period, Mr. Evans was engaged in the active conduct of gas undertakings, and for the greater portion of it held a conspicuous place among those who were developing and improving the processes for the manufacture, purification, and supply of gas.

Born in the year 1818, he was the son of Mr. John Evans, for some time one of the Engineers, and afterwards a Director of the Chartered Gas Company—a career which, in its mere outline, was remarkably duplicated by the subject of our notice. Mr. Evans, who was educated at St. Peter's Grammar School, Eaton Square, S.W., entered the service of the Chartered Gas Company in the year 1834, being then under 16 years of age. In 1836 he accepted an engagement with the Imperial Continental Gas Association, and remained in the employment of that Association for a short time at their gas-works in Berlin. Returning to London, in November, 1839, he re-entered the service of the Chartered Company, and from that time forward, although in varying capacities, his connection remained uninterrupted with it (the Chartered Company) until finally severed by his death. He was appointed Superintendent of the Brick Lane station in 1844, and removed to a like position at Westminster in 1848. During all this time the late Mr. George Lowe occupied the position of Engineer to the Company, Mr. Evans serving under him. In 1863, upon the resignation of Mr. Lowe, the chief place was given to Mr. Evans, and he continued to hold it until 1872, when he, too, retired, full of "honours," if not of "years," having largely contributed to the raising of the Company to that position of security and pre-eminence which it then held and still holds. In our "Circular" of Dec. 29, 1893, we noticed the retirement of Mr. George Lowe, after 42 years service, and proceeded as follows:—"He is succeeded in his office by Mr. F. J. Evans, who has for many years been the Engineer of the Chartered Company's works at Westminster, and it would be difficult to find a more competent successor to Mr. Lowe." The opinion thus expressed was founded upon the work he had already accomplished, and how fully it was justified by his subsequent career our readers well know.

Mr. Evans was possessed of great industry and a power of patient application and experimental research, which, cultivated in early days, remained with him till the last. He first devised and adopted the system, afterwards widely followed, of ventilating purifiers, and the foul material contained in them, so as to avoid nuisance when the charge was being changed. His discovery of the fact that oxide of iron, which had been used for the absorption of sulphuretted

hydrogen, could be "revived" and re-used many times for the same purpose, was the result of his "thorough" method of conducting investigations. Trying a proposed plan for the removal of ammonia, he noticed the changed appearance of the material after it had been exposed to the air, and immediately set himself to ascertain the cause; hence resulted what was practically a revolution in the method of purifying coal gas. The merit of this discovery is in no way lessened by the fact that others had been acquainted with the scientific facts involved. By Mr. Evans it was a matter of original observation, and the practical application was all his own. The designing of the enclosed photometer which bears his name, and which is now so generally employed, is another evidence of his individuality, and of his attention to the details of the work he was engaged in.

Mr. Evans may be said in some sense to have belonged to a generation which has gone. Most of those who were the contemporaries of his earlier years of work have either passed away, or had sooner withdrawn from the active pursuit of the profession to which they and he belonged. It is no small tribute to his continued application and freedom from prejudice that at the time of his retirement he held a more advanced position among the workers in that profession than at any earlier period in his career. He was not a man to travel in a rut, or to disparage the work of younger men; indeed, he seemed rather to be drawn towards the young and enthusiastic, and such have we know, found in him a congenial and sympathetic guide and companion.

It is doubtless in connection with the bold idea of the Beckton works, and the admirable carrying out of that idea, that Mr. Evans will be most widely known and remembered. It is not for us here to speculate as to the just apportionment of the merit of that really great conception. It is enough for our purpose to know that Mr. Evans was the responsible adviser of the Chartered Gas Company at the time; that when many of his professional brethren shook their heads, and foretold only disaster, he did not hesitate, but always confidently promised success; and that in his hands that success was fully attained. One of the dangers predicted was that the illuminating power of the gas would be so seriously reduced in the long journey to town, that the gravest consequences would ensue. Mr. Evans had already, before commencing the works, conducted a series of experiments, assisted, we believe, by Mr. Sugg, the results of which enabled him to listen to these prophecies with a calm mind and perfect confidence.

The honour due to Mr. Evans on account of the Beckton works by no means stops short at the mere idea. He devoted himself earnestly to the details of the great work, his talent as a draughtsman enabling him to prepare many of the original drawings with his own hand. That some portions of the diversified whole should have been open to, and received adverse criticism, was inevitable, especially when we remember that it was carried out under the

"fierce light" of such general observation. The errors, however, which had to be amended were conspicuously those of a man who thought for himself, and had the courage of his theories, and they were but as a drop of failure in the full measure of success. The later developments of the Beckton works have been carried out on the lines originally laid down by Mr. Evans, and the whole forms not only by far the most extensive and imposing gas-works ever planned but also probably the most complete and perfect in its general design and arrangement. To the memory of Mr. Evans, Beckton is an enduring monument, boldly conceived, thoughtfully designed, and successfully executed. Throughout the work he was fortunate in having the help of so loyal and accomplished a "right hand" as Mr. Wyatt, and we feel sure that we are acting as Mr. Evans would have wished in here associating that gentleman's name with his.

In 1868 Mr. Evans was appointed by the Board of Trade one of the first Metropolitan Gas Referees under the City of London Gas Act of that year—a position which he resigned in 1870. In 1872 he closed his long professional connection with The Gaslight and Coke Company, surrendering his position of Chief Engineer in the early part of that year. At the Shareholders meeting in April, the value of Mr. Evans's services was gratefully and cordially acknowledged, and, in recognition of them, he was unanimously and amid the cheers of those present, allowed a retiring pension equal to his former salary, and elected to a seat on the Board of Direction.

In his relations with those about him, especially with his brother officers, Mr. Evans was thoughtful and courteous, always ready to help or encourage those who were trying to do well. He often received the special thanks of the Court of Directors, and four times the officers of the Company expressed their regard for, and indebtedness to him, by presenting him with testimonials, which were by him highly prized. The members of the British Association of Gas Managers will remember how kindly he interested himself on the several occasions when the Association visited Beckton, sparing no effort to make the inspection as pleasant and instructive as possible. The last of these visits was paid within a month of his decease, and he then seemed as heartily interested in the matters he was explaining and discussing, and as concerned to do all he could for his guests, as at any previous time.

Almost the only words spoken by Mr. Evans after his seizure were to ask the question, "What was the cause?"—a question characteristic of the man. Although he had contributed a long life's work to the gas industry, he was only in his sixty-second year when he died. Because of that work he will be long remembered, and in a closer and more affectionate manner his memory will be cherished by the large circle of those who enjoyed his friendship, and so were enabled to appreciate the many virtues of his modest and kindly nature.

EXAMINATIONS IN "GAS MANUFACTURE."

The list of the successful candidates in the examinations held throughout the country last May, under the auspices of the City and Guilds of London Institute for the Advancement of Technical Education, has just been published. The following table, in reference to the examinations in the "Gas Manufacture" section, is compiled from the pass list:—

		Class of Certificate.	Prizes.	Previous Successes.
<i>Honours Grade.</i>				
Blair, Thomas	London	First.	First Prize, a Silver Medal and £5.	1879. Advanced First, with First Prize of £7.
Meiklejohn, Neill	Houghton-le-Spring	First.	Third Prize, a Bronze Medal.	1878. Elementary First, with First Prize of £5.
Hulse, William W.	Burslem	Second.		1879. Elementary First, with First Prize of £5.
Margetts, William Thomas.	Rochester	Second.		
McGillivray, Hugh.	Edinburgh	Second.		
<i>Advanced Grade.</i>				
Bell, John Ferguson	Liverpool	First.	First Prize, a Silver Medal and £3.	1879. Elementary First.
High, William Robert	London	First.	Second Prize, a Bronze Medal and £3.	
Hornby, John	London	First.	Third Prize, a Bronze Medal.	1879. Elementary First.
Akroyd, Benjamin.	Halifax	First.		1877. Elementary First, with First Prize of £5.
Aspel, Samuel Fisher.	Leicester	Second.		
Batten, William T.	London	Second.		
Dunfield, John.	Oldham	Second.		
Flambe, Hilary E.	London	Second.		
Meiklejohn, Charles	Houghton-le-Spring	Second.		1879. Elementary Second.
Sheard, John Tomlinson	Batley	Second.		
<i>Elementary Grade.</i>				
Lewis, Benjamin A.	London	First.	Second Prize, a Bronze Medal and £2.	
Dempster, Alexander.	Halifax	First.	Third Prize, a Bronze Medal.	
Baynes, Francis James	Bolton	Second.		
Jones, Richard Enos	Bristol	Second.		
Lovatt, George Thomas	Wolverton	Second.		
McLean, William	Oldham	Second.		
Morris, William Walter	Jarrow-on-Tyne	Second.		
Plant, Joseph.	Wolverton	Second.		1879. Elementary Second.
Wilkinson, Harry	London	Second.		

YNOXIL GAS COMPANY.—The annual general meeting of this Company was held yesterday, when the Directors reported that the works were maintained in good order. The profit for the year ended June 30 amounted to £1907, which allowed of a dividend being paid of 10 per cent. This would absorb £1492, leaving £425 to carry forward. During the past year the Company have carbonized 2121 tons of coal and cannel, costing £1378 17s. 2d., and produced 20,844,200 feet of gas, of which 17,423,600 feet were supplied for private lighting, and 1,988,000 to the public lamps. A WONDERFUL GAS WELL.—"An Occasional Correspondent" of the *Globe*, writing from Sheffield, Warren County, Penn., U.S.A., says: "The most wonderful part of Sheffield is a natural gas well. The gas from this well is used in the furnace of the tannery of Horton, Cray, and Co., and runs the machinery; it also lights all the houses in the town, being brought in iron pipes 2 miles from the well. It was discovered in boring for petroleum. Escape-pipes have been run up to a height of some 20 feet,

and the huge flames from these pipes flare away day and night, and have done so for the last five years. The daily amount given off is estimated at 2 million feet. The gas was found at a depth of 1830 feet, and blew all the boring machinery out of the well. The pressure is so great when turned full on that the gas blows itself out. The smell is not the same as coal gas, but more like petroleum. There is little doubt this gas vein is on the edge of a petroleum field, or, more probably, all the land near is underlaid with it. The amount has not been found to lessen, nor the pressure diminish in the whole five years. It seems such waste to see these six or eight escape-pipes flaming away day and night, as they have done for the last five years. How long they will go on no one can tell, but at present it looks as if for ever. At present they have found no way to utilize the gas except on the spot. There is a new petroleum well just successfully sunk at Clifton, 7 miles from Sheffield, and there is little doubt but that others will be found in the neighbourhood."

Communicated Articles.

THE IMPROVED GENERATOR FURNACES AT THE MUNICH GAS-WORKS.

By "ISCA."

Dr. Schilling, to whom we are indebted so much of the information at present available respecting the working of gas generator furnaces for retort-settings, has lately contributed to the *Journal für Gasbeleuchtung* a most instructive account of his latest improvements in this line, as embodied in the new gas generators constructed by him at the Munich Gas-Works. Proceeding on the same principles which distinguished his earlier gas furnaces, and which may be described as consisting of the admission of steam to the generator with the object of preventing the formation of coherent clinker therein, and of elaborate provision in the space underneath the retort-setting (where, in a stage retort-house on the English plan, the coke arches would be situated) for heating the air to be used in the second stage of combustion by the waste heat of the furnace gases, Dr. Schilling's improvements have been mainly directed towards perfecting the arrangements for heating the air in the regeneration, as he terms this process, and to providing a better means of producing the steam to be used in the generator. Respecting the former object, all designers of generator furnaces have recognized its importance; but the latter arrangement, the introduction of which was Dr. Schilling's own device for meeting a universally acknowledged defect, is a necessity of his own creating, and its economical advantages are much questioned by Liegel and others, who claim to have surmounted the difficulty without the introduction of more steam than can be supplied by an ordinary wet ash-pan. The cost of producing the required steam was a point of which Dr. Schilling's critics did not fail to make the most, and he appears to have himself felt that the idea was imperfect so long as special means of providing the steam continued necessary, and he now announces that by his last improvements the production of steam in the required volume is effected entirely without cost, by utilizing a portion of the waste heat of the furnace for this purpose.

On referring to the accompanying engravings, the arrangements for regeneration will be clearly understood.

The air passages are represented by the numbers 1 to 6, the smoke flues by the Greek letters α to ζ . The cold air enters at 1 into the canal 1' through the front wall, and travels back to the entrance of 2, then forwards to get into 3, then back along this to 4, then again forward, passing upwards to 5, along which it goes back to 6, and out of this it finally issues to meet the combustible gases from the generator at the "slit" or burner. The furnace or smoke gases, which pass out of the setting by openings underneath the bottom retorts, take a forward course from α to β , and then backwards in γ , and forwards in δ . From this point they pass through the flues δ' and ϵ underneath the boiler, and in ϵ they pass backwards to the main flue. Formerly the damper for the exit flues was between the retort-setting and the regenerator; but it has been altered to a point below, so as to control the draught in the regenerating passages also.

As regards the apparatus for producing steam, a sort of boiler is fixed in the bottom of the generator, and the smoke gases from the regenerator are led backwards and forwards under it before being allowed to pass away. Originally these gases, the volume of which became increased in the proportion of 100 to 170 by admixture of air, still possessed the temperature of 1470° Fahr. when permitted to escape. With the alteration in the regenerator from the old pattern, the volume of the smoke gases ceased to increase, and their temperature at departure never reached this figure. When the Bohemian coal was being used in 3-hour charges, the boiler which was first used, with a heating surface of 1.46 square metres, was quite capable of producing the necessary quantity of steam—about 570 kils, in 24 hours (0.5 kilo. of H₂O per kilo. of coal). When using Saarbrück coal in 4-hour charges, the quantity of steam required for which was 0.7 kilo. per kilo. of coal, it was found necessary to increase the heating surface of the boiler by lengthening it, and providing an additional tube for the smoke gases, so that the heating surface was made 2.8 square metres. In order to cause the air to enter the middle of the generator as completely as possible, and to prevent it from creeping along the walls, an inclined plate has been introduced which causes the air to pass over the surface of the water to the fire-bars. The air supply is also regulated by a valve $\frac{1}{2}$ inches square, but generally kept open about 1 inch only, in a plate in front of the inclined shield, so that the entire air supply, neglecting leakages, is maintained through an opening $\frac{1}{2}$ inches long by 1 inch wide. The whole arrangements, as actually working, are shown in the illustrations.

Respecting the working results, Dr. Schilling states that the improved generators have been working 21 months; during the last year carbonizing chiefly Saarbrück coal, with a mixture of 10 per cent. of Bohemian Platten coal. There was a stoppage towards the close of last summer, owing to the ascension-pipes getting choked, and thick tar forming in the hydraulic main. When the tar became cold, it was so thick that it would not flow, and it was very difficult to get rid of it. At the same time naphthalene was formed in large quantities, not so much in the works as in the town mains, frequently at considerable distances from the works. The heats in the retorts had been very high about this time, and with 3-hour charges upwards of 10,000 cubic feet of gas were produced per retort in 24 hours. The heats having been moderated, these inconveniences at once disappeared, and the system of working was altered, each retort being made to produce about 9000 cubic feet of gas per 24 hours, the heats being maintained

sufficiently high for this purpose. Under these circumstances the adoption of 4-hour instead of 3-hour charges appeared advantageous in an economic sense, and in this way the work was carried on without the slightest interruption throughout the whole of last winter. As a number of old fire-grate settings were in use besides the generator settings, the results of the latter were kept separate by special weighing and measuring. The following statement shows the working from the 7th to the 18th of January last, with Saarbrück coal alone:—

Production of gas per retort per 24 hours . . .	9,100 cubic feet.
" " " setting (8) per 24 hours . . .	72,800 "
Weight of coal carbonized per retort . . .	1,894 lbs. "
" " " " setting . . .	15,152 "
Production of gas per ton of coal (nearly) . . .	10,800 cubic feet.
Consumption of coke per setting in 24 hours . . .	2,086 lbs.
" " " 100 lbs. coal carbonized . . .	14 "

On comparing these results with those recorded of the former generator, the following will be found to hold good:—(a.) The production of gas is about 5.5 per cent. less than before; (b.) the consumption of fuel is decreased 20 to 25 per cent. The former result having been designedly produced with the object of lowering the heat in the setting, while the latter is due, in Dr. Schilling's opinion, to the fact that the air for the second or final combustion is better heated in the process of regeneration.

The chemical constitution of the generator gases and of the furnace or smoke gases was frequently examined, as was also the temperature and draught. These examinations gave the following results:—

Average composition of the gas from the generator.	CO ₂ =	9.1 per cent.
	CO =	19.8 "
	H =	13.9 "
	N =	57.2 "
100.0 per cent.		

Quantity of water admitted per kilo. of coal . . . = 0.72 kilo.

Average temperature of the heating gas taken in the flue close to the generator . . . = 2010° Fahr.

Average temperature of the previously heated air when passing from channel 5 to channel 6 . . .	= 2000° "
Do. when in channel 4 . . .	= 1150° "
Do. when in channel 3 . . .	= 930° "
Do. when in channel 2 . . .	= 930° "
Do. when in channel 1 . . .	(not accessible.)
Do. when entering through air-valve to channel 1' . . .	= 95° Fahr.

Average temperature of smoke gases on leaving the setting at α . . .	= 2280° "
Do. when in flue β . . .	(not accessible.)
Do. when in flue γ . . .	= 2010° Fahr.
Do. when in flue δ . . .	(not accessible.)
Do. when in flue δ' (under boiler) . . .	= 1110° Fahr.
Do. when in flue ϵ . . .	= 970° "
Do. when in flue ζ . . .	= 930° "

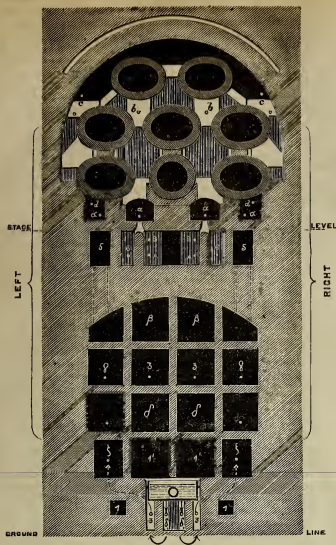
Composition of the furnace gases on leaving the setting.	CO =	18.6 per cent.
	O =	1.2 "
	N =	80.2 "
100.0 per cent.		

Composition of the furnace gases on leaving the regenerator at δ . . .	CO ₂ =	17.2 per cent.
	CO =	2.8 "
	N =	80.0 "
100.0 per cent.		

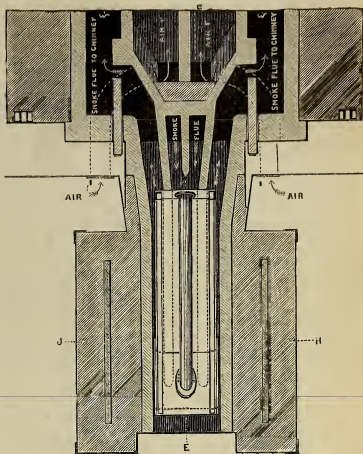
Draught under the generator fire-bars . . .		= 0.10 inch.
Do. at outlet of generator . . .		= 0.16 "
Do. at inlet of setting . . .		= 0.10 "
Do. in setting above the slit at a . . .		= 0.06 "
Do. in setting at c . . .		= 0.10 "
Do. in smoke flues.	at α . . .	= 0.15 "
	at γ . . .	= 0.18 "
	at δ . . .	= 0.28 "
	at δ' . . .	= 0.42 "
	at ϵ . . .	= 0.60 "
	at 1 . . .	= 0.13 "
	at 2 . . .	= 0.04 "
Do. in air passages.	at 3 . . .	= 0.03 "
	at 4-5 . . .	= — "
	at 5-6 . . .	= 0.10 "

On comparing these figures with those formerly recorded, the following differences will be noted:—(1) The air which was formerly heated in the regenerator to 1110° Fahr. only is now brought up to about 2010° Fahr. (2) The smoke gases which formerly passed out of the setting at 2010° Fahr., and in the regenerator were cooled down to 1470° Fahr., now pass out at 2280° Fahr., and leave the regenerator at about 930° Fahr. The previous heating of the air by the waste heat of the furnace gases has thus become more perfect.

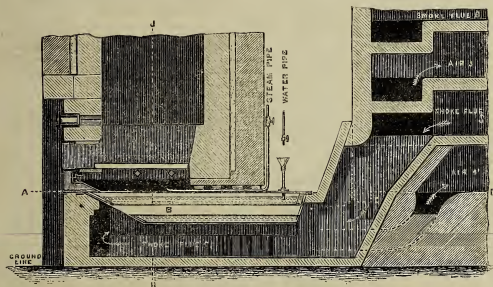
In the wages of the men employed in carbonizing a considerable economy has been secured. The cost for labour for seven generators is now 82.80 marks (about £4) per day of 24 hours, which is equal to about 11s. 6d. per setting. Assuming a production of 72,800



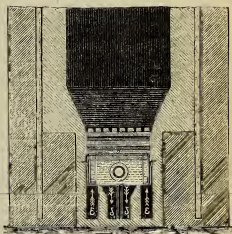
SECTIONAL ELEVATION.



SECTION THROUGH A. B. C. D. (GROUND PLAN).



SECTION THROUGH E. F. G.



SECTION THROUGH J. H.

cubic feet per 24 hours, the cost for labour is therefore about 1'88d. per 1000 cubic feet of gas.

Respecting the cost of maintenance and other details of working, Dr. Schilling remarks that the generators have not required repairs of any kind. The walls are perfectly sound, and no perceptible wearing or melting away has gone on inside. Opposite the outlet gas-flue a larger sight-hole has been put in, to give readier access for cleaning. Fireproof lids instead of cast-iron covers have been fitted to the charging-mouths, and answer the purpose admirably. The walls of the regenerator have not required repair, all passages being perfectly free from dust, and the edges of the slit-stones or burners have preserved their sharpness. Last summer it became necessary to renew those retorts which had been in use from the commencement. They had been worked at very high heats, the front walls were slight, and the retorts were only supported in three places besides the back and front ends. The lowest bearing blocks (over the slits) of the middle retort had melted. The new setting gives four bearing blocks inside. The front wall is constructed with one brick outside, then a non-conducting lining $3\frac{1}{2}$ inches thick, and a half-brick wall inside. The back wall is two bricks thick, and in some settings, by way of experiment, it has another half-brick wall with a non-conducting lining. Hitherto no fault has arisen in the retorts, and the front and back walls have remained vertical. The deposit of carbon in the retorts is burnt off every two or three

months, and is then not large, so that it is removable in about two hours. The dip in the hydraulic main is maintained at about $\frac{3}{4}$ inch.

(To be continued.)

EXPLOSIVE MIXTURES OF COAL GAS AND AIR.

By Mr. W. FOSTER, M.A., &c.,

Professor of Chemistry at the Middlesex Hospital.

SECOND ARTICLE.

The first determinations of the velocity of flame in an explosive mixture of gases were made by Professor Bunsen, of Heidelberg. In the case of a mixture of oxygen and hydrogen in the proper proportions for complete chemical combination, the velocity of the transmission of flame through the mass of the mixture was found to be 37 yards per second, whilst in the case of a mixture of carbonic oxide and oxygen in their proper proportions, the velocity was less than a yard per second. Professor Bunsen further found that when such explosive mixtures were diluted with a gas which did not take any part in the combustion, or when there was an excess of either gas in the case of each of the simple mixtures just referred to, the velocity of propagation of the flame was diminished. The method of experiment adopted in these investigations was to force the explosive mixture from a reservoir through a long, narrow tube. The velocity of the gas stream was observed when it was just

sufficient to maintain the position of the flame constant with reference to a point in the side of tube. More recently Professor Mallard, of the French School of Mines, has extended this inquiry. He has made a number of experiments in a manner similar to that of Professor Bunsen, using mixtures of marsh gas (fire-damp) and air, and coal gas and air, in different proportions. We have already seen that 2 volumes of marsh gas require 4 of oxygen for complete combustion, therefore 1 volume requires 10 of atmospheric air to effect the same purpose. It is an interesting fact that the velocity of transmission of flame in such a mixture is less than the maximum possible. It was found that a mixture of 1 volume of marsh gas and 8½ of air gave the highest velocity, and this was a little more than half a yard per second. With mixtures of coal gas and air the velocity of transmission of flame is greater than with mixtures of marsh gas and air. This result would be anticipated on a consideration of the composition of coal gas and the results obtained by Professor Bunsen, which have just been referred to. Common coal gas contains about half its volume of hydrogen, and therefore its chief component, when mixed with air, furnishes a mixture the rapidity of inflammation of which is very high—in fact, much higher than that of a mixture produced by any one of the other components of coal gas and air. But in all the cases of explosive mixtures now under notice there is a relatively large quantity of inert gas present—namely, nitrogen—which diminishes the rate of inflammation, as shown by Professor Bunsen. In M. Mallard's experiments on mixtures of coal gas and air, he found that with the particular sample of coal gas employed, the maximum rapidity of inflammation occurred with a mixture consisting of 1 volume of coal gas and 5 of air. This gave a velocity of rather more than a yard per second. In a published lecture by Dr. Thorpe, of Leeds, on the theory of the Bunsen lamp, a summary of M. Mallard's observations is given. I have taken the liberty of expressing the mètres of the original table as yards:—

Volumes of Air mixed with One Volume of Coal Gas (Composition not given).	Rapidity of Inflammation in Yards per Second.
6½	0.308
6	0.672
5½	0.893
5	1.073
4½	1.100
4	1.019
3½	0.806
3	0.105

It is obvious from a perusal of this table that the velocity of propagation of flame in explosive mixtures of coal gas and air may vary very considerably. When the mixture consists of 1 of coal gas to 7 of air, we may safely consider the velocity as being not greater than a foot per second; whereas if the mixture consists of 1 of gas to 5 of air, there would be a velocity of not less than 3 feet per second.

Let us now consider the bearing of these principles on every-day practice. Suppose an explosive mixture (1 of coal gas to 7 of air) to be placed in a suitable vessel, and in communication with the external atmosphere by means of a cylindrical pipe several feet (say 6) in length, and further suppose that the internal diameter of the pipe is half an inch. If the pressure of the explosive mixture be the same as that of the atmosphere, but little of the former will escape into the external atmosphere. That portion which does escape is due, firstly, to the fact that the explosive mixture is lighter than atmospheric air; and, secondly, to the superior diffusive power of the explosive mixture. At the most there would be but a slight smell of gas if an observer were to place his nose close to the extremity of the open pipe. On the application of a flame to the extremity of the open pipe, the mixture would ignite, and the flame would traverse the length of the pipe quietly with a velocity of about three feet per second. In two seconds from the application of flame to the open pipe the explosive mixture in the containing vessel itself would be ignited, and an explosion would almost immediately follow, the character and extent of which would be modified by the shape of the containing vessel and the total volume of the explosive mixture.

Now let us suppose that the explosive mixture in the vessel has a pressure which is greater than that of the atmosphere, and that this pressure is maintained constant by artificial means. The escaping mixture can be ignited as before; but whether it will give rise to an explosion in the containing vessel, or not, depends on the velocity of the gas stream along the ½-inch pipe. If the velocity be anything greater than 3 feet per second, the explosive mixture in the vessel will not be ignited; but if the velocity be anything less than 3 feet per second, the flame will pass down the pipe with a velocity which is the difference between the two velocities—namely, that of the transmission of flame by the explosive mixture, and that of the gas stream along the pipe. If the velocity of transmission of flame be 3 feet per second, and the velocity of the explosive mixture along the pipe and at its external orifice be 2 feet per second, then the velocity of the flame with reference to the sides of the cylindrical pipe will be 1 foot per second, and, consequently, it will require six seconds for the transmission of flame from the external orifice of the pipe to the mass of explosive mixture in the containing vessel. We can therefore express the behaviour of explosive mixtures in a general way by saying that so long as the velocity of the explosive mixture at the point or points where it escapes into the atmosphere is greater than the velocity of transmission of flame through the explosive mixture, there will not be an explosion in the containing vessel on the application of flame to the above point or points.

It will be as well if we now consider what is the velocity of a stream of gas in our ordinary arrangements for burning common gas. It is usual to consume it at the rate of 5 cubic feet per hour

per burner. Some burners within my reach are attached to a metal pipe, the internal diameter of which is 2-8ths of an inch. Using the same factors as in our former calculations, the length of such pipe necessary to hold 5 cubic feet of gas is 184.000 inches, or 611½ yards. Dividing this number by 3600 (the number of seconds in one hour), we obtain 51 inches, or 4½ feet, as the velocity of the gas stream per second in the pipe, when gas is consumed at the ordinary rate. But the orifice of the burner itself is much less than 2-8ths of an inch in diameter, and therefore the velocity of the escaping gas at this point must be something considerably greater even than 4½ feet per second. It follows, therefore, that if in our ordinary domestic arrangements there should be an accumulation of an explosive mixture of gas and air through a defect in the pipes, or other unforeseen circumstance, there is no reasonable chance of the slightest danger arising from the application of flame to the explosive mixture escaping from the burner at the ordinary pressure. Were it otherwise, accidents might possibly occur.

We have now discussed at some length the conditions necessary to be maintained in order to prevent the ignition of explosive mixtures of gas and air in containing vessels when they are at the atmospheric pressure, as well as when they are at higher pressures. We have just seen that the possibility of danger chiefly consists in the pressure being so slight as to cause the stream of the explosive mixture to have less than a certain velocity. If, under these circumstances, the pipe be wide enough to allow combustion of the explosive mixture to keep up its own temperature of ignition, the explosive mixture in the containing vessel must eventually be ignited. Now, in ordinary practice the pressure of coal gas (we will not go so far as to say explosive mixture) may be determined roughly by the application of a light, and there is no doubt that this practice is often adopted. In the case of vessels which may contain mixtures of gas and air, the application of flame in the ordinary way is most dangerous, especially if the pressure inside the vessel be nearly the same as that of the atmosphere. In the absence of that which is to be determined by the test—namely, superior pressure, there is every probability of an explosion following the application of the test itself. In order that a flame may be applied as a test of the combustibility or otherwise of the gaseous mixture, or to roughly determine its pressure, it is necessary that the pipe or jet should be specially constructed. By diminishing the diameter of the pipe, so as to make it very small, we prevent the possibility of flame passing into the interior of the containing vessel, and in order to compensate for the small quantity of gas or explosive mixture passing outwards through such small pipe, it is necessary to arrange a number of these in the form of a bundle. A compound tube made up of a number of very narrow tubes would then permit of the escape of sufficient gas, or of the explosive mixture, at a very low pressure, and flame could then be applied to the external orifice to indicate the character of the escaping gas, without any danger of ignition of an explosive mixture in the containing vessel. Such an arrangement has long been in use for burning explosive mixtures of oxygen and hydrogen. A simpler arrangement, and one which can be easily constructed, consists of a piece of metal tube, upwards of an inch in diameter, and several inches in length, packed with carefully-cut discs of fine wire gauze. The discs must fit the internal part of the pipe accurately, otherwise their function will be imperfect. In either case flame cannot pass backwards under any circumstances so long as the bundle of metallic pipes or the cylinder packed with discs of wire gauze is kept at the atmospheric pressure.

We have now to consider the conditions favourable to the production of mixtures of coal gas and air, and the laws which regulate their formation. Taking common air as the standard substance, the specific gravity of common gas ranges between 0.4 and 0.5. We may therefore regard it as possessing half the density of atmospheric air. It has weight, as is implied by its specific gravity, and is therefore subject to the laws of gravitation, like all material substances. When it escapes in atmospheric air, it tends to ascend, and this arises from two circumstances—firstly, the coal gas is the lighter of the two substances; and, secondly, both coal gas and air are examples of a fluid body. The particles of a fluid are readily susceptible of change with reference to each other and to those of a second fluid when there are differences of specific gravity, or when pressure is applied, and the like. When a jet of unignited coal gas escapes in an ordinary way, the lighter gas particles ascend, in consequence of their freedom to move, not only with reference to themselves, but also with reference to those of atmospheric air. So far, therefore, as the laws of gravitation affect the gas and air particles, the former ascend to the upper portions of the apartment, displacing the heavier particles of air; and were there no other influence besides the laws of gravitation in operation, the gas particles would collect in the upper portion of the apartment unmixd with air. As a matter of common observation, we know that this separation of gas and air into distinct layers does not occur; and, further, that when the gas and air particles are thoroughly mixed, either by natural processes or artificially, there is no separation of gas and air into two layers on allowing the mixture to remain at rest. The lighter gas particles do slowly mix with the heavier air particles in opposition to the law of gravitation, and in the course of time the former will be equally dispersed through the air of the apartment, supposing there to be no chance of escape for either gas or air. The lighter gas diffuses itself through the heavier air in obedience to certain laws. These we will next consider.

The Directors of The Gaslight and Coke Company announce that, subject to audit, the accounts for the half year ended on the 30th ult. show profit sufficient for a dividend on the ordinary stock at the rate of 11 per cent. per annum.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.

SESSION 1880.

PROGRESS MADE TO SATURDAY, JULY 24.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Ackworth, Featherstone, Purston, and Sharlston Gas Bill	Lords	Comms. Bill Feb. 9	June 25 Feb. 10	July 5 March 8	July 15 June 15	July 20 June 24	..
Birkenhead Borough " " "	Lords	Comms. Bill Feb. 9	June 25 Feb. 10	July 5 March 8	July 15 June 15	July 20 June 24	..
British Gaslight Company, Limited (Staffordshire Potteries), Bill	Lords	Comms. Bill Feb. 10	Feb. 10 Feb. 10	Feb. 23 Feb. 23	June 17 June 17	June 22 ..	..
Burton-upon-Trent Corporation Bill	Lords	Comms. Bill Feb. 9	June 24 May 27	July 5 June 4	July 20 June 23	.. ..	..
Cardiff Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 16 March 11	March 11 May 25	May 25 ..	..
Chester Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 20 March 8	March 11 June 15	June 15 ..	June 29
Cork Gas Bill	Lords	Comms. Bill Feb. 9	March 12 Feb. 10	March 19 June 4	June 4 June 8	June 8 ..	June 29
Cork Improvement Bill	Lords	Comms. Bill Feb. 9	Bill with- drawn	Feb. 24 March 2	March 2 ..	March 11 ..	..
Dagenham and District Farmers (Optional) Sewage Utili- zation Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	March 1 Feb. 16	June 18 July 19	July 19 ..	..
Derford Gas Bill	Lords	Comms. Bill Feb. 9	June 25 July 5	July 5 June 15	July 15 June 24	June 24 ..	..
Dearne Valley Water Bill	Lords	Comms. Bill Feb. 9	July 9 Feb. 10	July 16 Feb. 17	July 23 June 15	July 8 ..	..
Denton and Haughton Gas Bill	Lords	Comms. Bill Feb. 9	July 15 Feb. 10	July 23 March 17	March 17 May 31	May 31 ..	June 29
Doncaster Corporation Water Bill	Lords	Comms. Bill Feb. 10	Feb. 10 Feb. 10	Feb. 16 March 17	March 17 May 25	May 25 ..	June 29
Eastbourne Gas Bill	Lords	Comms. Bill Feb. 9	May 28 June 4	June 8 June 24	June 24 June 28	June 28 ..	July 9
Edinburgh and District Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 16 Feb. 26	Feb. 26 March 2	March 2 ..	July 14
Exmouth and District Water Bill	Lords	Comms. Bill Feb. 9	March 5 June 25	March 15 July 1	June 1 June 10	June 10 ..	..
Gaslight and Coke, Commercial Gas, and South Metropolitan Gaslight and Coke Companies Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 23 Feb. 23	June 11 June 24	June 24 ..	..
Great Yarmouth Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 17 July 9	July 9 July 19	July 19 ..	..
Hinckley Local Board Gas Bill	Lords	Comms. Bill Feb. 9	July 6 July 15	July 15 July 19	July 19 July 22	July 22 ..	..
Huddersfield Tramways and Improvement Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	March 1 June 25	June 25 July 5	July 5 ..	..
Hull Lighting Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 16 July 19	July 19 July 23	July 23 ..	..
Hyde Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 16 June 28	June 28 ..	.. ..	..
King's Lynn Corporation Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 23 June 14	June 14 Preamble	Preamble not proved.	..
Lancashire County Justices (Water, &c.) Bill	Lords	Comms. Bill Feb. 9	July 6 Feb. 16	July 15 June 9	June 9 July 5	July 5 ..	..
Lancaster Corporation Bill	Lords	Comms. Bill Feb. 10	Feb. 10 Feb. 10	March 11 June 15	June 15 March 13	March 13 ..	June 29
Lincoln Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 16 March 12	March 12 June 18	June 18 ..	July 19
Liverpool Corporation Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 16 July 13	July 13 July 16	July 16 ..	July 19
Liverpool United Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	March 12 June 8	June 8 June 21	June 21 ..	..
London Gaslight Company Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 24 July 19	July 19 May 27	May 27 ..	..
Maidstone Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	March 1 July 15	July 15 July 19	July 19 ..	..
Malton Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 23 June 22	June 22 July 1	July 1 ..	..
Oldham Improvement Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	July 5 June 11	June 11 June 24	June 24 ..	July 19
Phoenix Gaslight and Coke Company Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	March 8 July 15	July 15 July 22	July 22 ..	..
Portmadoc Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 16 June 17	June 17 July 5	July 5 ..	..
Preston Gas Bill	Lords	Comms. Bill Feb. 10	Feb. 10 Feb. 10	Feb. 16 May 31	May 31 June 8	June 8 ..	..
Preston Improvement Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 16 July 16	July 16 June 25	June 25 ..	June 29
Rathmines and Rathgar Township (Vartry Water Supply) Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 16 June 7	June 7 Preamble	Preamble not proved.	..
Rathmines and Rathgar Township Water Bill	Lords	Comms. Bill Feb. 10	Feb. 10 Feb. 10	Feb. 16 June 7	June 7 June 14	June 14 ..	..
Reading Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	June 29 July 8	July 8 July 15	July 15 ..	..
Rochester Corporation Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	March 1 July 15	July 15 June 28	June 28 ..	..
Sea Water Supply to London Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 23 June 22	June 22 July 1	July 1 ..	..
Sligo Borough Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	July 5 June 11	June 11 Preamble	Preamble not proved.	..
South Metropolitan Gas Company Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	March 8 July 15	July 15 July 22	July 22 ..	..
Southwark and Vauxhall Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 16 June 17	June 17 July 5	July 5 ..	..
Stafford Borough Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 23 July 1	July 1 July 9	July 9 ..	..
Wakefield Corporation Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 23 March 17	March 17 June 1	June 1 ..	July 19
Wandsworth and Putney Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 16 June 25	June 25 July 7	July 7 ..	..
Wigan Improvement Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	June 25 July 5	July 5 June 9	June 9 ..	July 19
Wrexham Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	March 2 July 5	July 5 July 19	July 19 ..	..
Yeaden and Guiseley Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	Feb. 17 July 1	July 1 June 6	June 6 ..	..
" " "	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	March 4 June 11	June 11 June 21	June 21 ..	..
" " "	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	July 5 July 12	July 12 July 15	July 15 ..	..
" " "	Lords	Comms. Bill Feb. 9	Feb. 10 Feb. 10	March 10 June 11	June 11 June 22	June 22 ..	..

HOUSE OF LORDS.

MONDAY, JULY 19.

GAS AND WATER ORDERS CONFIRMATION BILL.—This Bill received the Royal Assent by Commission.

TUESDAY, JULY 20.

The Liverpool Corporation Water Bill was referred to a Select Committee, consisting of Lord Emly (Chairman), Viscount Sherbrooke, Lord Inchiquin, Lord Gormanston, and Lord Trevor; to meet on Thursday, July 22.

THURSDAY, JULY 22.

The Chairman of the Select Committee on the Liverpool Corporation Water Bill reported that the Committee had not proceeded with the consideration of the Bill, having found that the petitioners had no *locus standi* before them.

The Chairman of the Select Committee on the Dagenham and District Farmers (Optional) Sewage Utilization Bill reported that the Committee had not proceeded with the consideration of the Bill, the opposition thereto having been withdrawn.

HOUSE OF COMMONS.

TUESDAY, JULY 20.

A requisition to withdraw his petition against the Rathmines and Rathgar Township Water Bill (Lords) was presented from Edward Cecil Guinness.

THE LIGHTING OF THE BRITISH MUSEUM.

Mr. D. GRANT asked the right honourable member for Cambridge University (Mr. Walpole), as one of the Trustees of the British Museum, whether arrangements for lighting could be made by which our great national collection, or the main portion of it, could remain open to the public until ten o'clock at night every week day throughout the year.

Mr. WALPOLE said he was very happy he could not at present give such a favourable answer to the question as he could wish to do. The proposal had been before the Trustees on more than one occasion, and they had always found, on consultation with the highest and best authorities, that the use of gas would be very injurious to some of the collections. They had, therefore, never been able to see their way to sanction the lighting of the Museum by gas to any extent, but it was possible the time might come when the use of gas could be effectually superseded by the electric light. Some experiments had been made in this direction last winter; but, so far, they did not seem to justify the extension of the electric light to certain parts of the building. The matter, however, might be left in the hands of the Trustees, who, he believed, would take the earliest opportunity of giving it their best consideration.

HOUSE OF COMMONS COMMITTEE.

MONDAY, JUNE 21.

(Before Mr. DODDS, Chairman; Mr. SCHREIBER, Mr. J. MCCARTHY, and Mr. NORTHCOLE; Sir JOHN DUCKWORTH, Referee.)

MAIDSTONE GAS BILL.

(Concluded from page 100.)

Mr. HAWKLEY recalled, and further cross-examined by Mr. MICHAEL. I produce a statement, prepared from official returns, showing the illuminating power prescribed and yielded; the limit of sulphur prescribed, and the maximum, minimum, and average quantities yielded; together with the cost of purification of the gas supplied from the Beckton works of the Gaslight and Coke Company from November, 1873, to November, 1879. [The return showed that the maximum of sulphur allowed was either 20 grains or 15 grains, according to the season; the average quantity actually found ranged from 1.55 grains in November, 1873, to 9.1 grains in May, 1878. The standard of illuminating power during the whole of the period was 16 candles, the average of that actually obtained ranging from 18.49 in August, 1875, to 16.40 in November, 1875. The cost of purification in November, 1873, was 0.88d. per 1000 ft. In the year 1874 it was 1.05d.; 1875, 1.08d.; 1876, 1.14d.; 1877, 1.06d.; 1878, 1.08d.; and 1879, 1.2d.]

Mr. MICHAEL: There is one matter to which I now direct your attention. Where did you ever purify gas from sulphur compounds, and use first oxide of iron in order to take out the sulphuretted hydrogen, and then purify by lime afterwards for the purpose of getting rid of the sulphur compounds and the carbonic acid?

Witness: Where the two have been used together. The other course, though it produces a better chemical effect, is a nuisance, and ought not to be adopted. The former method has been adopted in Sunderland, Cambridge, and Nottingham.

You first use oxide of iron?—First we use oxide of iron to remove the offensive element of the gas—the sulphuretted hydrogen—and then the gas passes on to the lime, which acts perfectly in removing the bisulphide of carbon, as it is commonly called, to within very much less than 20 grains—down to as little as 10 grains—if necessary, and it takes out all the carbonic acid. But what is necessary to be provided against in this mode of treatment is, there shall be enough lime to take out the carbonic acid in the first lime vessel, and enough lime in the subsequent lime vessel to catch the displaced bisulphide of carbon. I have carried out this process in various places at an ordinary cost of about 1d. per 1000 feet, and generally with one set of purifiers.

You ask yet a chemical question. When you have taken out the sulphuretted hydrogen by means of oxide of iron, and transferred that gas to the lime, what is it that takes out the sulphur compounds?—The lime itself; or indeed any alkali will do it.

Are you aware that you alone, among all chemists and engineers, hold this view?—I am quite sure I am not alone. But what is better than my opinion is, that I do it. It is not at all necessary to have the sulphide of calcium in the first vessel, although it is a little cheaper.

If so simple a process is immediately at hand, avoiding the possibility of nuisance, can you give me any reason why, after all this trouble and agitation, the London Companies have not adopted it? The London Companies, both gas and water, are, in many respects, a long way behind many people in the provinces.

There has been a great difficulty experienced by the London Gas Companies with respect to this question of sulphur, has there not?—There has been no difficulty at all, except that which arose from having a bad arrangement of apparatus, and un instructed people to work the purifiers. It can be done easily and cheaply, with advantage to the companies as well as to the public.

We had the pleasure of seeing here for several days Mr. Vernon Harcourt, one of the Metropolitan Gas Referees; do you consider him an authority on the matter?—Yes; but if Mr. Vernon Harcourt were to say that what I am doing every day could not be done, I should call him a negative authority. He is not a practical gas-maker.

Would you also say that Mr. Harcourt's idea as to the cost of purifying from 40 to 20 grains is negative?—I cannot see how Mr. Harcourt can have any well-formed opinion upon the subject, because he is answered by the table I have put in, which shows that 1d. per 1000 feet, or there-

abouts—both before and after the passing of the Act to which you referred—has left the sulphur below 20 grains.

You know that Mr. Harcourt was examined on the Bills of the Crystal Palace and another Gas Company who sought to be relieved from the limited number of grains of sulphur?—Yes; and I was also examined, and the Companies lost on both Bills. This is all that I have to say, and I cannot exonerate the Companies in regard to their conduct.

We know all about your hoghead of sulphuric acid?—My own office will produce a hoghead of very strong liquid, containing sulphuric acid and the condensed moisture formed by the combustion of coal gas.

Do you provide in your office any means for the exit of the gas which has been burned?—It was in consequence of providing those means that I made the discovery, because I led away a pipe from the burner for the purpose of taking off the products of combustion. That pipe condensed the moisture which was formed during combustion, and I found that the water was remarkably acid.

That is, you had a pipe and something in the nature of a trumpet-mouth over each burner, and so carried away the products of combustion?—Yes; carried them into a chimney, instead of allowing them to foul the air of the room.

If you had not provided the means of entrance for air as well as exit for it, you would not have had the products of combustion so carefully removed, would you?—The air was the air of the room, coming in through doors, windows, ventilators, and other openings provided in the office.

I understand you to say that three days average is of so little value as to nullify the whole of the procedure?—Yes; the three days ought not to be regarded in actual fact, where there are not authorities similar to those in the Metropolitan, where you have not only a Gas Examiner, but also three Gas Referees, and over them an appellate judge, while in the country there is nothing of the kind.

Therefore it is very much harder on provincial gas companies. You have destroyed the whole value of your argument because you have argued from my point of view. In the country there is no appellate jurisdiction, while in town there is, and therefore if a London company fail on one day in the matter of sulphur purification, they may go before that appellate jurisdiction and say, "From unavoidable or accidental causes the standard has been exceeded." There is more behind this. In the Gaslight and Coke Company's Act of 1875 they obtained the insertion of that particular clause about the three days. I did not give evidence upon the Bill—I wish I had—but it is very important to know, in connection with it, that the Gas Referees have the power of fixing from time to time what shall be the standard of sulphur in the gas, and the purifiers of the Act the Referees have fixed the impurity in summer as low as 15 grains.

That is suburban?—Beckton is the largest gas-works in the world, and supplies all London.

By the Chairman: The Referees have fixed the impurity at Beckton at 15 grains in the summer, and 20 in the winter; and it will be found that during every day since the passing of the Act, the Company have kept within the limits prescribed by the Referees, and that has been done at the cost of 1d. per 1000 feet, in round numbers.

Mr. MICHAEL: Is it not the fact that when the Metropolitan Gas Bill was introduced in 1875, it was without the average of three days clause?

Witness: I cannot tell you.

Mr. MICHAEL said it was not in the Bill as introduced, but abandoned. It was, however, followed in the Commercial Company's Act, which was passed by Mr. Forster's Committee as a result of the general investigation. The 38th clause in the Act said "the average of all the testings of illuminating power and pressure prescribed under this Act on each day shall be deemed to represent the illuminating power and pressure respectively on that day;" and the 39th clause stated that "the average of all the testings of purity prescribed under this Act on three successive days shall be deemed to represent the purity on each of such days." This was all that was now asked for. The Company agreed to the 20 grains, and asked to be protected in the same way as the Commercial and other Metropolitan Gas Companies were.

THE CHAIRMAN: Mr. Hawley rather draws a distinction between metropolitan Acts and those relating to places in the country. He says that Mr. Michael is right, first, the Gas Examiner, then the Gas Referees, and then the judge.

Mr. MICHAEL: All that is in favour of the Gas Company, because it gives them a bridge to help them over a difficulty. (To witness:) Is it not the fact that coals differ very considerably not only as to the quantity of sulphur, but also as to the sulphur compounds contained in them?

Witness: Yes; there is a considerable difference in coals, but not so much in regard to sulphur compounds as there is in regard to the products much in regard to sulphur compounds other than those which produce carbonic acid. Commercial coals will contain from 1 to 2 per cent. There is twice as much sulphur in one kind of coal that there is in another, it being very often in compounds not yet found by chemists.

Therefore, you may one day be operating on one sample of coals, and on the next day, without any warning, be operating on a sample entirely different, as regards sulphur compounds, both as to quantity and quality?—That is so, but every Gas Engineer learns to know how he is to treat the gas produced from coals which are ordinarily sold in the market for gas-making purposes.

Do you mean the Committee to understand that you, with all your practical experience, can put on this side a ton of coals, and on that side a ton of coals, and be able to tell, before you have made the gas, what the increase or decrease will be in it, each day?—Yes; entirely so, if I am experienced in the use of those coals.

I mean from the aspect of the coal itself?—No. I know whether it is Pelaw, or South Hetton, or any other description of coal which is ordinarily purchased in the market. But it all comes to the point that I have no difficulty in keeping the sulphur of any coal down within 20 grains per 100 feet.

You differ from everybody else in having no difficulty, when they experience very considerable difficulty?—You assume that. I can only say this: Let them go to one of my works, and let me go to their works, and I dare say I shall have bad gas in my works under their bad management, and I shall make good gas in their works under my management. It is not the man who cannot do the thing, but the man who can do it, who is to be regarded.

Is the testing for sulphur compounds so very certain?—No; but the mode of preventing the introduction of sulphur compounds is the simplest thing in the world.

Let us come to another matter—namely, the differential price of 1s. per 1000 feet, proposed to be charged within the new limits prescribed by the Bill. Do you think it fair, in the interests of the consumers in Maidstone, that this differential charge should be inserted in the Act?—I do, and I do not. I think, and I know by experience, that the additional cost is about 3d. for every mile of gas, by reason of the increase of capital and partly by the increase of leakage; and the two together require, in order that justice should be done to both parties, that beyond a certain limit—which may differ in every case according

consumers of Maidstone if, when a retort had ceased to be useful, they were to revert to capital for the renewal of that retort; or if, when a 2-inch pipe had to be replaced by a 10-inch pipe, or old premises had to be rebuilt, the expenses were charged to capital.

The CHAIRMAN said he thought Mr. Hawley had put that matter right.

Mr. MICHAEL said Mr. Hawley had struck down the Company's figure of 1s. 2d., over an average of 14 years, to 7d., and had referred, as a justification, to entirely new works existing in London. If he had taken other works of the same age as those at Maidstone, he would have found that 9d., 10d., and 11d. represented the proper figures. The price of coal and iron might so rise immediately, that it would be perfectly impossible for gas to be produced for anything like the price it was at present. The Committee were legislating for 12 years to come, and Counsel on the other side had acknowledged that the Company ought to have 1d. per 1000 to provide for matters beyond their control. An exceptional year ought not to be taken, and the Company be bound down to it. The careful attention of the Committee was next invited to the question of illuminating power, which the Corporation should be raised to 16 candles, although 14-candle gas was consumed in more than two-thirds of the United Kingdom. Mr. Hawley said that if the consumers had 16-candle gas they would burn less of it, so that the light would be exactly the same, and therefore they would be content with exactly the same illuminating power as they now complained of. Besides Mr. Hawley's evidence on this point, the Committee had that of a gentleman, who called himself a gas analyst, although not an analyst of burners, as if the whole matter of the illumination of a room did not depend on the fitness or otherwise of the burners employed. This gentleman seemed to have an idea that there was something mysterious and spiritual in the character of gas, which made it different from any other gas, in that a burner might be made to misrepresent the illuminating power of the gas, and make it show one or two candles more than its absolute light-giving value. It was an insult to common sense to talk such nonsense. If the Committee considered the Corporation would go back rejoicing, and power, candles, and light, and economy were to be obtained, he would say to the gas consumers, "What is the history we have to tell you, the Company? we shall have 16-candle gas now, and have no more unsanitary conditions in Maidstone;" while all the time the great Gas Engineer who said he could revolutionize gas-making if he had it all under his control, might be able to make a difference, because the consumers might burn the same quantity of gas as before. If he had a retort that would burn out of the mouths of the witnesses for the Corporation, sufficient to justify a price of 4s. per 1000. He would not refer to the evidence which had been given by the promoters. The Committee might consider it as their duty to say that Mr. Livesey was a gentleman who knew nothing, although he had raised the question of the Corporation to the highest pinnacle to which a gas company could be raised; that neither Mr. Keates, nor Mr. Spice, nor Mr. Penny was a gentleman whose evidence was to be taken as being of any value; nor was the working of Mr. West (who he considered to have conferred a very great boon on gas companies) showing how a larger quantity of gas could be obtained from coal than had ever been done before) to count for anything, but taking Mr. Hawley's own figures, it must still be contended that 4s. per 1000 was a proper price to fix as a standard. With regard to the zones which had been referred to, there would be a difficulty in working them, and it was much more simply to have a uniformity of gas in the main, and another 1s. beyond, especially as Mr. Hawley had said that no injustice could be done to Maidstone by this course. There was one other point, and that was settled by Mr. Hawley's own evidence. With respect to the amount of capital required, he differed from the promoters, and said, in substance, "Instead of putting up a gasholder to contain half a million of feet of gas—which the Company said was necessary and was the economical way of doing it—"I would do it in two." The Maidstone Gas Company doubled their make in twelve years, and the Bill was to last that; but Mr. Hawley would put up a gasholder to last for seven years. Did this thing establish the fact that the Company had taken advantage of it to the town to have at the end of seven years to apply for permission to erect another gasholder? If the Corporation of Maidstone wished in seven years time to spend £3000 or £4000 in parliamentary expenses, it would not be because they wanted cheap gas, but because they wished for the security of their gas, and acting for things they were not entitled to receive. A gasholder was not a thing which was put up a quarter of a gasholder could not be put up; but Mr. Hawley had made no provision for additional capital which would then be required. This gentleman had said over and over again that it was not judicious to be concerned with applying to Parliament on the same questions, and also that twelve years was a fair time for a company to take to erect a gasholder, and powers; and in the present case the Company were asking for this time. The only two things remaining which Mr. Hawley objected to were the excess of the £5500 so far as the gasholder was concerned, and the £7000 for purifiers. As regarded the former, he said that a holder of the capacity of 550,000 cubic feet was sufficient to last for seven years, and at the end of this time a similar, if not larger quantity of storage would have to be provided. As to the purifiers, at least another set was required, if not two sets more; but on this point nothing need be said, seeing that there had been several objections waiting to be called, who would have told the Committee that to pass gas through a set of purifiers was for the elimination of sulphur compounds was at variance with every principle of common sense, and too absurd to be argued upon. It was sufficient to say that in London it could not be done, but the Companies were obliged to adopt an entirely different plan; and because they could do it for 13sd. per 1000 feet at Beckton, where there was no objection to work with all modern appliances, and where such an immense quantity was made—it did not follow it could be done at the same price in a place like Maidstone. Leaving out these items of £5500 and £7000, the special attention of the Committee was directed to the question of capital, and it could not be believed that the directors of a gas company were so fool as to conduct their principles on which commercial undertakings were carried on as to imperil their profits by wasting their capital; and by the action of the sliding scale the Parliament had devised the best guarantee to prevent the possibility of a penny being taken away from the Company improperly. With respect to sulphur, the Company were willing to resort to the benefit of the Corporation only on this point was whether or not that which applied to the Metropolis should apply to Maidstone. He (Mr. Michael) thought he had thus disposed of the whole of the opposition to the Bill, and with the Committee considered he asked the Committee to grant the powers showed which would ensure quite as much to the benefit of the Corporation and the consumers as it would to the benefit of the Gas Company.

The CHAIRMAN: Will you turn to the preamble, "Whereas it is expedient that the Company should be authorized to manufacture, purchase, or hire, and to use, for the purpose of supplying gas, any machinery, or other apparatus, and to sell gas and other fittings, &c." You do not propose that the Company should become manufacturers of those fittings?

Mr. MICHAEL: No, they never do; but the clause is exactly in the form in which such clauses have been passed continuously by Parliament during the last thirty years. There is nothing about it in the petition.

Mr. KINGSFORD: We object to it.

Mr. MICHAEL said he had not directed attention to the matter because he

assumed the Corporation were satisfied it was desirable. The object was not to manufacture, because no doubt the Company would be able to purchase cheaper than they could make.

The CHAIRMAN: Then why ask power to do it?

Mr. MICHAEL: Because, if we had not the power to do so, if we had to make a brass pipe or a connection, we might be restricted, and serious consequences in the working might ensue.

After some further conversation, the committee-room was cleared. On the Council and parties being called in.

The CHAIRMAN said the Committee had decided to pass the preamble of the Bill, with amendments. With reference to the extension of the limits, they were of opinion that such extension should not be granted. The recital in the preamble concerning the manufacture, sale, and hire of fittings, &c., was to be omitted. The Committee also thought that the new capital should be limited to £50,000, with borrowing powers of £12,500; that the standard price should be 3s. 8d.; and the illuminating power fixed at 15 candles, as offered by the Company. They had also decided, with reference to the sulphur test, to give 20 grains, with the three days average clause; the testing place to be decided upon between the parties, and inserted in the Bill; and the Corporation to have power to test at any time without giving notice.

TUESDAY, JULY 22.

Mr. MICHAEL said that, with regard to the recital in the preamble, which the Committee had struck out on the previous day, giving power to the Company to manufacture, purchase, or hire, and let and sell gas and other fittings, and engines, stoves, and so on, the Corporation were willing that those words should be reinserted, and also the clause carrying out borrowing powers, on the understanding that the word "manufacture" was omitted.

Mr. CLABON (Parliamentary Agent) having assented, The CHAIRMAN said the Committee would reinsert both preamble and clause as amended.

Mr. MICHAEL then proceeded with the Clause 4, referring to the extension of limits, was struck out.

On clause 17, providing for the formation of an insurance-fund, Mr. CLABON objected to the Company having both an insurance-fund and a reserve-fund, and asked that the clause should be omitted.

Mr. MICHAEL said it was Lord Redesdale's clause, framed after full consideration of the Gas-Works Clauses Acts of 1847 and 1871, its object being to enable gas companies to be their own insurers, in case of any accident, from fire or other causes, arising on the works. The clause had been inserted in every Act which had been passed since the sliding scale was adopted.

The CHAIRMAN said the Committee thought the clause should stand.

On clause 19, referring to the reserve-fund, which was also objected to, Mr. MICHAEL said this was another of Lord Redesdale's model clauses, and had been expressly altered by Mr. Warner.

The clause was agreed to.

Clause 22 was altered by the insertion of £50,000 capital instead of £80,000, and the granting of £12,500 borrowing powers instead of £20,000.

Mr. CLABON said that supposing, instead of borrowing the £12,500 on mortgage, the Company raised it by shares or stock, it was quite clear that the clause should be done after the auction clause, and if the clause provided for this he had nothing more to say; but if not he should like words to be inserted to this effect.

Mr. COOPER (Parliamentary Agent) said the clause was in the stereotyped form.

Mr. MICHAEL said that formerly there was a general power, under the Companies Clauses Act, to convert all borrowed money, or the larger portion of it, at the option of the company, into capital; but of late years Lord Redesdale had insisted that if this conversion took place it should be at a rate not exceeding 5 per cent.

Mr. MICHAEL said his impression was that they would not, but he was going far beyond this. There had been a hard fight before a Committee of the House of Lords with respect to the British Gaslight Company—a Company which was a large place under peculiar circumstances, rendering it extremely difficult to issue the capital under the auction clauses—and the Committee passed the capital because it was limited to a dividend of 5 per cent., which was a benefit to the consumers. In London gas stock was sold by auction to pay 57½ per cent., and therefore no hardship could be done by the clause, but by the clause being passed in its present form, whereas, if it were not so passed, all expenses incident to the sale would be so much loss, and would thus be a disadvantage to the consumers.

The CHAIRMAN said the Committee would insert the clause as it stood.

Clause 35 was amended by the omission of the word "manufacture" in relation to the sale, &c., of fittings and other things.

On clause 54, a saving clause, preserving the rights of the Corporation of Maidstone.

Mr. COOPER said in the Bill, as received from Mr. Warner, that clause had been struck out.

Mr. CLABON said he thought it should not be omitted. He did not think saving clauses were of any great value, but it was usual to have them inserted.

Mr. MICHAEL said he could endorse what Mr. CLABON had said as to the value of saving clauses, and the Company were willing for the clause in question to be inserted in the Bill.

The CHAIRMAN said he could not agree that saving clauses were not of value, and he thought the clause ought to stand the same as in the former Act.

The clause was agreed to, as were also the schedules to the Bill.

Clause 60, restricting the amount of capital to be issued in any one year, was agreed to.

On clause 40a, referring to purity and illuminating power,

Mr. CLABON said the words which had been introduced specified that "from and after one year from the passing of the Act," the gas should not contain more than 20 grains of sulphur. He took it that it should read "from the passing of the Act."

Mr. MICHAEL said there would be all the proper apparatus to put up.

Mr. CLABON said the evidence most distinctly showed that it could be done at once.

Mr. MICHAEL said that might have been the evidence given on one side, and by the gentleman who did not know how gas was purified. By the use of the present purifiers and apparatus there was a quantity of sulphur left in the gas which was very strongly complained of by the Corporation, and to remedy this the Company would be obliged to erect additional apparatus, and it was reasonable to subject the Company to penalties during the whole time they were preparing the apparatus to carry out the decision of the Committee?

Mr. CLABON said that some of Mr. Adams's returns showed that the Company were at present purifying the gas so that there should only be 10 grains of sulphur.

Mr. MICHAEL said it must be considered that in summer there was

very little difficulty; but when the Committee were about to fix a maximum, it was a very different matter, because the times as much gas would have to pass through the purifiers in the winter.

The CHAIRMAN suggested "from and after the 1st day of January next."

Mr. MICHAEL: Cannot you say February?

The CHAIRMAN said the Committee would agree to this. The three days average, however, would not apply to the illuminating power of the gas, as no application had been made to the Committee with reference to this subject.

Mr. COOPER suggested a separate sub-section, providing that the average of the testings taken on one day with regard to the illuminating power should be deemed to be the illuminating power for that day—which was the existing legislation for the Metropolis—otherwise one test only taken on one day might fix the Company with penalties for deficiency, whereas other tests taken during the same day might be above the necessary standard, and free them from liability to penalty.

The CHAIRMAN: One witness said the Company could change the illuminating power in a very short time.

Mr. MICHAEL: The usual clause with regard to tests is that they shall be made in the evening, when the light is really required.

Mr. CLARON said the last sub-section was to the effect that the Company should not be liable to penalties unless complaint were made to the Board within 15 days, which was a very short time; it ought to be 30 days.

Mr. MICHAEL suggested "two justices" instead of "the justice."

The CHAIRMAN said the Corporation only met periodically, and any report from the gas inspector would have to go before them. He thought it better to be better, and to be better.

In reply to the Committee, Mr. COOPER said that if the tests were made in the morning, when but a small quantity of gas was being consumed, and that mostly for cooking and heating purposes, the illuminating power might be below the standard, while at the time when it was usually required, for lighting purposes, the gas might be as much above the required standard as it was previously below it. In such case the effect of taking the average of all the testings on that day would be to exempt the Company from penalties.

Mr. MICHAEL said it would be a simple thing to define the hours, and say between seven and ten o'clock.

The CHAIRMAN: We have considered that they might test at any time. (To Mr. Claron:) What do you say to Mr. Cooper's suggestion?

Mr. CLARON said he would leave it in the hands of the Committee.

Mr. COOPER said it was in the Metropolitan Acts passed since 1875 as the result of the recommendations of Mr. Forster's Committee.

The CHAIRMAN: How are you to get at the average in Maidstone, when there are no Referees?

Mr. MICHAEL said he did not see how the clause was to work, unless they had Referees to decide the number of tests, whereas between six or seven o'clock and eleven the Corporation might test as often as they pleased.

The CHAIRMAN: We do not think we can interpolate the sub-section, but must leave the matter where it is. A member of the Committee reminds me that the Corporation thought they ought to have 16 candles instead of 15.

The clause, as amended, was added to the Bill.

On clause 40b, allowing an officer of the Company to be present during the testings, but not to interfere with them,

The CHAIRMAN said this clause entirely subverted the decision arrived at, and could not be inserted.

Mr. MICHAEL said the object of the clause was obvious. It was a criminal proceeding in order to enforce penalties, and if an officer of the Company were not present there might be a mis-reading or an incorrect testing, and no evidence could be offered on the part of the Company, and therefore they would be at the mercy of the examiner for the time being. He had never known a case where an officer of a company had not been admitted.

Mr. COOPER said the clause was in exact conformity with the Metropolitan Acts.

The CHAIRMAN said that was an agreement between the parties, which had received the sanction of Parliament; and if the proposed clause had been agreed to it would have been another matter.

Mr. CLARON said that if notice was to be given every time, the Company would have an opportunity of restoring the illuminating power to the proper standard, and the value of the decision of the Committee would be destroyed.

Mr. MICHAEL said that unless the clause was inserted the Company could not watch the testing.

Mr. CLARON said they would be able at any time to bring the evidence of the testing at their own works to show that the testing at the appointed place was an improper one.

Mr. MICHAEL said the Company would have to take continuous testings from morning till night, because they would not know when the Corporation were testing.

Mr. WEST, in reply to the Chairman, said the gas was tested for sulphur, and also for illuminating power, twice a day, and records kept of the results; but no set times were appointed.

The CHAIRMAN suggested the words, "and it shall not be necessary for the Gas Examiner to give any notice of such testing to the Company."

Mr. MICHAEL said he had no objection to this.

The clause, as amended, was added to the Bill.

On clause 41a, referring to the testing-place, Mr. CLARON said there seemed to be some doubt whether it should be fixed at the market-place. He therefore proposed to add the words, "or some other place to be agreed on between the Corporation and the Company."

Mr. COOPER said he had no objection to the proposed insertion, but asked that the Corporation should provide a separate testing-place for the Company in the same building.

The CHAIRMAN said this was but reasonable, providing the Company bore their own expenses.

Mr. MICHAEL said he agreed to this.

The clause, as amended, was then agreed to, and the Chairman was directed to report the Bill, with the amendments, to the House.

PROPOSED PURCHASE OF THE NEWCASTLE-UNDER-LYME GAS-WORKS BY THE TOWN COUNCIL.—On Thursday, the 15th inst., an extraordinary general meeting of the Newcastle-under-Lyme Gas Company was held to consider the notice given by the Corporation of their intention to purchase the gas-works under the powers contained in the Newcastle-under-Lyme Corporation Act, 1877, and to take powers from the Shareholders to negotiate with the Corporation, and to complete the sale. Mr. Hargreaves, the Chairman of the Company, presided. After consideration of the question, it was decided to offer the undertaking to the Corporation at a certain price, in order to avoid if possible an arbitration, in accordance with the above-named Act, under the provisions of the Railway Companies Arbitration Act, 1869.

Miscellaneous News.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

INAUGURATION OF NEW WORKS AT CANNOCK.

The formal opening of the new works recently completed by the South Staffordshire Water-Works Company in the neighbourhood of Cannock took place last Wednesday, when, at the invitation of the Directors of the Company, close upon a hundred gentlemen, the great proportion of whom were connected with the Local Authorities of the districts embraced in the Company's limits of supply, assembled to inaugurate the virtual completion of the scheme begun by the Company at Lichfield some twenty years ago. In a subsequent issue we may lay before our readers some account of the rise and progress of the undertaking, beyond that given by the Chairman (Mr. Frank James, J.P.) at the luncheon referred to farther on; now, however, we must principally with regard to the machinery.

A special train for the convenience of the visitors left Birmingham, where the offices of the Company are situated, for Cannock, which was reached about half-past ten. Here six well-appointed four-horse drags were waiting to take the party to the Huntington pumping-station—a drive of something like three miles, and they were met by the Company, as well as that at Hedgesford, was much admired, and elicited many marks of approval from those who had the opportunity of inspecting it. The drive from one pumping-station to the other was over the Cannock Chase, and it proved a very pleasant part of the day's outing. The company then proceeded to the Scout House reservoir, on the high ground, just outside Hedgesford; and here, after a survey of the work that has been completed, luncheon was served in a marquee erected on the Company's ground.

The whole of the work required for the service of the Company's extensive district—which includes Burton-on-Trent, Stretton, Cannock, Hednesford, Wednesbury, Haslemere, Halesowen, Palsall, Walsall, Rushall, Wednesbury, Darlaston, Upper Sedgley, Coseley, Tipton, Upper and Lower Gornal, Dudley, Brierley Hill, Brockmoor, Pensnett, Rowley Regis, Halesowen, West Bromwich, Oldbury, and Smethwick—is pumped from wells sunk in the deep water-bearing strata on the east and west, and of various kinds of distinct geological strata. The main source of supply is the conglomerate, or pebble-bed formation, a subdivision of the new red sandstone rocks, situated near Hedgesford and Huntington, and on the Penkridge side of the Huntington belt. The quantity of water obtainable here is very large, and much in excess of the Company's present requirements. It is served from the two wells already referred to, about 3½ miles apart, whence it is pumped into the Scout House reservoir.

The distribution of the water is effected by the use of large pumping-engines, which force it through the mains into the district, where the local service reservoirs and engines maintain a constant equable pressure at the many varying levels. From Lichfield, the water pumped at Sandfield is conveyed by a main in a north-easterly direction to Burton-on-Trent, whilst a southern main carries another portion along the South Staffordshire Railway to Walsall, Wood Green, and Wednesbury. Here the system is joined by the trunk main from the Scout House reservoir, which, passing in a southerly direction through Blaxwick and Walsall, strikes Wood Green, on its way to the high land of Rowley farther south. All these places are dominated by the Scout House reservoir. For reaching some of the high-lying districts about Dudley, there is a pumping-station at Wood Green, where the water is re-pumped, and this is so contrived as to secure the full force of the pressure from the Scout House reservoir without adding to the pumping power. For casual needs, there are two auxiliary pumping-engines at Conegrey (Tipton), which may be used in emergency to re-pump the water to some of the varying levels of the district. Generally, it may be observed that the whole apparatus of engines for pumping and re-pumping, of reservoirs for storing, and of mains for distributing the water, is very efficient for a much larger demand than the Company has yet experienced.

For pumping the water from the primary sources of supply, there are eight engines, representing in the aggregate 1125 nominal horse power, and capable of pumping 144 million gallons in 24 hours. For re-pumping to the higher levels there are five engines of 620 nominal horse power in the aggregate, and enough to pump 100 million gallons in 24 hours. Eight of the thirteen engines are Cornish non-rotary engines, with special adaptations of pumps, &c., and they are models of mechanical excellence in economy and steadiness of work, combined with the greatest durability. The aggregate storage capacity of the reservoirs is 178 million gallons. Of these the principal are Stove Pool (Lichfield), with a capacity of 39 million gallons; the Moat reservoir (Walsall), which covers 6 acres on a site 220 feet above Stove Pool, and is calculated to contain 33 million gallons; and the Scout House reservoir, at Hedgesford. There are 81 miles of pumping or trunk mains, and 189 miles of distribution or branch mains. The trunk mains are calculated to deliver 112 million gallons of water per day in 24 hours. The number of houses at present supplied by the Company is 35,381, representing a population of 179,155, in addition to which there are 1306 trading establishments supplied. During the past half year the daily consumption of water has been about 5,154,000 gallons, which gives an average of 88 gallons per head of the population paying for water; but correcting this calculation for domestic supply only, the average per head per day is about 22 gallons. This average is exceptionally high, in consequence of burst mains, frost, &c. The average of the past seven years has been 16 gallons per head per day for domestic use.

The older portion of the works was planned by the former Engineers of the Company, Messrs. McLean and Stileman, and carried out under their direction and that of Mr. Marten. The new works in the Cannock district, and the mains connecting them with the rest of the Company's system, as well as the pumping-station at Wood Green, the reservoir at Rowley, &c., were planned and carried out under the superintendence of the Company's present Engineer, Mr. W. Vandyke.

The cost of the various works and extensions has necessarily been heavy, and (as regards the original or older portion) more so than it would have been if the Directors had not been hampered by the financial troubles caused at the outset by the difficulty experienced in placing the shares. Engineering difficulties, arising from the many abrupt variations of level in the South Staffordshire district—which, seen in section, resembles nothing so much as the waves of the sea in rough weather—and the necessity for finding additional sources of water, contributed to swell the cost of the mains and pumping machinery and reservoirs, and to increase the capital outlay much beyond the original estimate. Thus, instead of £100,000, the cost of the first portion of the Company's capital account, including mortgage bonds and preference stock, now amounts to

might be reduced still farther. The Company had gone on improving in this respect for several years. Considerable alarm had been caused, wherever large numbers of labourers were employed, by the Employers Liability Bill, which had been recently introduced into Parliament. He thought the principle of the Bill was a right one, and only fair and just, and the Directors of the Company had acted on that principle. They had at the works a club which every man was expected to join, and in case he should be disabled by accident or sickness, the workman received 7s. per week from the club, and the Directors then supplemented it with a like amount. By this means every man would, in the event of accident happening to him, receive from 50 to 75 per cent. of his wages. If some clause having this object could be introduced into the Bill, he thought it would do away with a great many of the objections raised to it.

Mr. W. COLWILL seconded the motion.

Mr. W. P. HARVEY said he did not see in the accounts any reference to the manufacture of sulphate of ammonia, and he thought the salaries, rates, and taxes ought not to be included in one item. He also wished to know how the Company's reserve-fund was invested.

The CHAIRMAN said the salaries last year were £910; in the previous year, £865 18s.; and they had been paid to the officers of the Company. The Directors received an honorarium of £230 a year for their services. The quantity of ammonia produced last year was 100 tons, and it cost £1700 gross. The reserve-fund was invested in colonial bonds, and was earning a little over 5 per cent. Interest was added to the principal.

The motion was carried, and the dividends recommended in the report were agreed.

The retiring Directors, Mr. R. Oram and Mr. T. S. Honey, were re-elected, and Mr. Mogg was re-appointed Auditor.

A vote of thanks to the Chairman, Directors, and Officers of the Company was then passed, and the CHAIRMAN having briefly replied, the proceedings terminated.

THE NATIONAL EXHIBITION OF BELGIUM.

(FROM OUR OWN CORRESPONDENT.)

Two intend, in a series of lectures from a Brussels gentleman, to lay before our readers an account of the practical details of special interest to them in the "National Exhibition of Belgium," now being held. We publish to-day the first of his communications.—[E. J. G. L.]

When the visitor to the exhibition has gone through the section of Arts and Manufactures, which is, by the way, the most interesting one in the whole exhibition—which should not fail to take a glance at the *Palais de l'Industrie*, on a very small scale, of the Brussels Gas-Works. It is possible that the model itself will not present any striking feature; but if the visitor happens to be connected with the gas industry, it will suggest to him the idea of paying a visit to the gas-works themselves. My advice would certainly be not to do so, and the reason is, I should be somewhat surprised if he did not afterwards thank me for it. I, therefore, send you a few particulars respecting these works, which I think will be interesting to your readers.

The city of Brussels has been lighted with gas since the year 1819 (Ann. 24). The number of street-lamps first used for the public lighting was 700, which had increased to 1200 in 1839; while at the present time there are 4400 public lamps in use. The first concession was granted to a private company; but in 1844 it passed into the hands of the Imperial Gas Company Association. When the concession was to be renewed, in 1873, the Municipality, desiring to have the gas works removed from the city; and subsequently resolved upon taking the gas supply into their own hands. An extensive site, comprising nearly 25 acres of land, was purchased at Laeken, a suburb of Brussels, and upon this it was arranged to erect gas-works. The works were not until December, 1874, that the new works were commenced, and they were carried out according to the plans and under the superintendence of M. Somzée, the Engineer to the Municipality. By the month of August in the following year the works were sufficiently complete to commence making gas, though they were not yet quite finished. The cost of the new works, including the amount expended on the purchase of the old establishment, and on the alterations, in thoroughly overhauling and renewing the service-pipes, was about £490,000. The price of gas is now 20 centimes per cubic metre, which is equal to 48. sd. per 1000 cubic feet. At the beginning of the present year there were in use 10,997 meters, and the total number of consumers supplied was 163,000.

The new works are situated near the Schaarbeek Terminus and the Willebroeck Canal, and with these they are connected by lines of railway. The annual consumption of coal amounts to 60 millions of kilograms; and the annual consumption of coke amounts to 60 millions of kilograms; and the annual consumption of coke amounts to 60 millions of kilograms. The most important portions of the coke have been constructed in such a manner as to be capable of producing 30 million cubic metres of gas per annum. This year the production may be estimated at 17 million cubic metres.

The principal buildings are the retort-houses and coal stores, the purifiers, the houses, with the annexes; the gas-holders, workshops, and offices.

The retort-houses, four in number, are parallel with each other. Each house contains four groups of eight beds of retorts; and each bed contains 7 retorts; consequently there is a total of 896 retorts. The distillation of coal lasts for a period of four hours, and a bed of retorts produces about 1400 cubic feet daily. The retorts are placed in pairs; the retorts are closed by a new kind of lid, with tightly fitting joints, which do not require any cement. The heating of the retorts is done by coke only; the air that is consumed in the fire-gate being previously heated by the gases disposed under the beds. The arched roof of the furnace and the retort chamber is covered with a layer of bricks, and the space between the space to prevent the dissipation of heat. The ascension-pipes are connected to the horizontal receiving-main by rectangular bends, so that all the pipes are easily accessible. The hydraulic main is of much the same form as a quarter circle, and the upper part being laid. It is separated in length by a sheet-iron riveted to the upper side. Between the end of the sheet-iron and the bottom of the hydraulic main a space of 2 inches is left, so that the tar, &c., collecting at the lower part of the main is easily drawn off without interfering with the working.

From each bed the main gas passes through a series of conducting-pipes, 15½ inches in diameter and 49 feet in length, for each group of 10 beds of retorts, and from thence through cascade scrubbers, of which there are sixteen, having a height of 36 feet and a diameter of 8.2 feet. They are worked in pairs. In this apparatus the cleaning of the gas is finished, and it is finished in a large scrubber, a collecting one, 137 feet in diameter, and 78.8 feet high. The gas arrives at the centre of the base of each scrubber, and passes over and under flat discs held between pairs of hollow opposed discs kept cool by surrounding water. After traversing these it passes through four layers of coke kept continually damp by spray of water, and then it passes through a large scrubber. The water that has passed into the large scrubber is drawn off by means of the gas-engine into the cisterns of small scrubbers, and by this double circulation the water is charged more and more highly with ammoniacal products, which are driven off with the gas, and at last it comes to the degree of saturation required for its treatment. The scrubber cylinders,

which are of sheet iron riveted together, are provided with doors for the removal of the coke; and at the top the water cisterns are surrounded by an ornamental wood cover. The passage of the gas through the large scrubber is regulated by the purity of the gas after its exit from the other scrubbers, the deposition of the naphthalene being facilitated by a jet of steam, and the bottom surface of condensation, instead of the condensing-pipes on the retort-house walls, is nearly 19 square feet per 1000 cubic feet of gas made in 24 hours.

The coal stores are five in number, and they are placed alternately with the retort-houses. Each will contain 1600 tons of coal. Railways, crossing them in their lengths, allow of the coal being sucked under the most economical conditions. The coals used are from the Borinage, Ruhr, and Newcastle basins. At times Scotch coals are employed, when it is desired to increase the illuminating power of the gas. Belgian coals are sent in railway trucks; foreign coals by boats.

From the scrubbers the gas is drawn by two of Schmitt's exhausters, with automatic regulator, supplemented by a Kirtling one. They are arranged so that the gas may be delivered either into the gas-holders or into the city mains, and they are of such a power that only one engine is sufficient during the summer season. The speed of the engines is regulated by indicators with electric signals. The motive power for the retort-houses is supplied by three horizontal boilers of 20-horse power.

The purifying materials employed are lime and oxide of iron. There are 26 purifiers, 6 metres long and 3 metres wide. Each is provided with a by-pass valve, and other valves divide the purifiers into series and batteries. Usually the gas passes through the oxidising purifiers, and afterwards through the lime purifiers. The holders are disposed in two parallel rows in a special building provided with a steam travelling crane. They have the ordinary external case and water-jacketed cover, but, in addition, they have an internal frame which supports the trays. When it is desired to change a purifier, these frames are lifted out with their trays, and the whole is transported by the travelling crane to a place where the re-ventilation takes place by means of a forced current of air. This arrangement reduces the purifying labour to a minimum. A De Nayer boiler of 70-horse power supplies the motive power.

On its way to the holders the gas passes through three station-meters, each having a measuring capacity of 1,765,000 cubic feet per day, at the rate of 100 revolutions per hour, and from these it passes into four holders, three of which have a capacity of 390,000 cubic feet each, and the other of 780,000 cubic feet. A fifth one, of a capacity of 780,000 cubic feet, is about to be erected. The tanks are entirely above ground, and are made of sheet iron, riveted together, and are supported by four of their whole height. They are 33 ft. 6 in. high, and 117 feet in diameter. The larger one, as well as the holder which is not yet erected is 33 ft. 6 in. high and 164 feet in diameter. Its construction is a special one. The lower 17 feet are composed of a series of superposed channel irons, riveted together, and the upper part is strengthened by T-iron hoops. The joint between two channel irons is secured with iron cement. The upper part of the tank is of sheet iron. The holders are single-lift, and are constructed without any trussing for the roof, which, when the holder is landed, is supported by a wooden frame, and the water during the filling is externally sustained by vertical channel irons, and internally have angle-iron gusset stays at the top. At the top and bottom of the larger one there are box girders, which act as stiffeners, and also, being filled more or less with water, are employed to adjust the pressure. Gas thermo-syphons are employed to maintain a uniform temperature in the water during the filling, and which, being fixed to the holders is that the gas enters and leaves at the top, instead of, as is usual, at the bottom of the tank by underground pipes. At the two opposite ends of the diameter are fixed two double tubes, one inside the other; the space between being filled with water, to make a hydraulic joint for a pipe which leads thereto, and which, being fixed to the top of the holder, rises and falls with it. The gas enters the bottom of the internal tube after passing through a stop-valve, rises therein, and enters the holder through an elbow fixed and strongly stayed thereto. At the top of the moving pipe is a disc-valve, so that by this and the other means the portion of gas which is not yet used may be returned to the telescopic arrangement, either at the exit or entrance side, both being alike. Many advantages are claimed for this system, more particularly with reference to facility for repairs and cleaning, and non-liability of the supply-pipes to be broken by contraction or settling of the tank foundations. The arrangement has the advantage of enabling the holder to be seen from the connections for the entrance and exit of the gas.

The coke which is produced is chiefly sent to Flanders. That sold for private requirements in the city is subject to special treatment, which consists in breaking and separating it according to its size. Two coke breakers worked by a gas-engine of 6-horse power will deliver 11,000 bushels of coke every day. The breeze produced by this operation is used for making agglomerated tar blocks, manufactured in the works, and used for heating the retorts. A compressed fuel machine in one of the coal stores will turn out 20 tons of this fuel per day. The ammoniacal liquor is either formed into ammoniacal sulphate, or concentrated in Solvay's distilling apparatus.

I must say that the lighting of the city of Brussels is not quite so easy as in other towns; indeed, it is a very uneven place. The difference of level between the lowest part and the highest is 74 metres, or 297 feet; hence the necessity for having two mains, one for the lower and the other for the higher district. Beyond this six Giroud's regulators are fixed at a point half way between the two mains, and by this means the pressure is kept uniform. The gas therefore passes into the town by two lines, one of 23½ inches in diameter for the higher parts, and the other of 33½ inches for the lower parts. The joints, which are made on M. Somzée's principle, are of conical form, rendered tight by a nut and a ring, and are perfectly self-regulating. The portion of the pipe between the joints is 11 feet long, and the diameter varies from 3 to 35½ inches.

The entrance gate of the works is in very fine style, and I think I need not add anything to the foregoing description to show that the city of Brussels has not spared any expense in order to have, if not the largest, at least the most attractive-looking gas-works in the world.

THE PURCHASE OF THE WELLINGTON WATER-WORKS BY THE IMPROVEMENT COMMISSIONERS.—At the meeting of the Wellington Improvement Commissioners last Wednesday, a letter was read from the Local Government Board sanctioning a loan for the purchase of the water-works by the Commissioners, on the condition that the loan should be repaid by the Local Health Act, repayable in 40 years. The Chairman (Mr. Knowles) proposed to rescind a resolution of the Commissioners passed last November, which provided that the purchase of the water-works should be by arbitration, so as to enable it to be made by private treaty, and the raising of an honorary loan to be granted under the provisions of the Local Health Act, against it, the Chairman gave his casting vote in favour, and declared the motion carried. The Clerk, however, ruled that it was necessary for two-thirds of the members of the Board to be present and vote on the question before any action could be legally taken. The motion therefore was withdrawn.

SOME NOTES FROM AMERICA.

(FROM OUR OWN CORRESPONDENT.)

Gas affairs in New York remain in about the same condition as at the date of my last letter; while in the sister city—Brooklyn—the second opportunity has been allowed to pass unimproved, whereby the gas supply of that city could be put on a more satisfactory basis. Ever since the latter part of last year, when the attempt to consolidate the several Companies proved fruitless, negotiations in a private way have been going on, which would end in combining at least five of the seven Companies supplying the city. Unfortunately this second attempt at amalgamation has met the same fate as its predecessor, and, as a consequence, it seems that the present state of affairs is to remain unchanged.

In Baltimore great wisdom has prevailed. The three Companies of that city have combined, and from June 30 they lose their individuality, and exist under the common name of the "Consolidated Gaslight Company of Baltimore City." The capital stock will be 6,000,000 dols. (£1,200,000), divided into three equal parts, or 2,000,000 dols. to each Company. Bonds of the Consolidated Company for 3,000,000 dols. (£720,000) are to be issued, of which 1,600,000 dols. (£320,000) are to be divided among the Stockholders of the Baltimore Company, to reimburse them for the capital investments they have made out of revenue account; to the People's Company 300,000 dols. (£40,000) for a like reason; the remainder of the bonds to be applied to taking up the outstanding bonds of the three Companies. Time would prove the wisdom of combining; but the consumers can hardly look for any great benefit when the Company, with their large capital and bonded indebtedness, will have to make a profit of 1 d. 36 cts. (5s. 5½d.) per 1000 feet of gas sold simply to pay 10 per cent. interest on their capital, and 6 per cent. on the bonds. I neglected to state that the gas is sold at 10 cts. per 1000 feet.

Edison has not yet made public any new invention which will place gas companies among the things of the past. Whether he has really given up his scheme of revolutionizing the lighting of the world, or is pursuing his labours with great quietness—which would be something very unusual for him to do—no one can tell. He has, however, a large stock in his company cling to it very tenaciously. I still hold to my opinion, that though he may again bring out some novelty in electric lighting—ingenious but impracticable—which will send the price of the stock up to a fabulous figure, yet he will fail to change things to such an extent as to force the gas either to suspend, or make gas only "for other than illuminating purposes."

A few of the leading papers here have been advocating the use of Ericsson's calorific engines, for driving the electric light generators for private houses. These little engines, working by the alternate expansion and contraction of gas, are of the same design for running on steam, water, and such light weight in private dwellings. The heating of the air may be done by a small coal furnace, or better, gas may be used. An engine with an 8-inch cylinder, using 15 feet of gas per hour, will raise in the same space of time 350 gallons of water to a height of 50 feet. The New York Herald, an American paper, says: "The great bar to the introduction of the electric lamp for house illumination is taken up in such a manner as to prove or disprove its practicability has hitherto lain in the lack of a convenient, easily-managed, and reliable motor, at a small cost, capable of operating a generator of electricity sufficiently powerful for domestic purposes. There is no sort of doubt of the adaptation of the Ericsson motor to supply this deficiency. . . . The experience of Professor Draper, who lights his Madison Avenue mansion by electricity, furnished by a generator operated by means of a gas-engine, has been that the illuminating capacity of 1000 cubic feet of gas can be nearly doubled by employing it to generate the electricity. . . . Such being the case, and wealthy gentlemen of New York City, who cares to test the practical working of the electric lamp, has it in his power to decide upon the availability of electricity for domestic purposes by that best of all methods—the method of experiment under the precise conditions which it must meet successfully, or fail as an illuminator. . . . Mr. Ramsden, of New York, has been so far from making pretensions to such a practical test of availability as that just suggested? Very likely they will not. Electricity has to supersede gas in street lighting before it can supplant it for illuminating dwellings; and, if this small motor were the only thing which has hitherto been wanting, gasit houses would long have been the thing of the past; for what better motive power could be desired than a small gas-engine?"

At the recent meeting of the Western Gas Association—the full minutes of which are to be found in their official paper, the *American Gaslight Journal*—the subject of gas engines and stoves received considerable attention. Mr. Ramsden, of New York, and Mr. Ramsden, of New York, "Otto" silent engine, which he had imported from Germany, and placed in a grain elevator in his city, supplying the motive power for two elevator belts 60 feet high, one 10-inch conveyor 135 feet in length, a wheat-cleaner, fan, and pump, with a consumption of only 117 cubic feet of gas per nominal horse power hour. The price of gas being 2 dols. 75 cts. per 1000 feet makes the expense of this engine 40 cts. (4s. 7½d.) per hour. It is evident that this engine is not worked to its full power, so for the sake of comparing it with a steam-engine, I will take it as doing 10-horse power work.

Expense of Running a Steam-Engine of 10-Horse Power.

3½ lbs. of coal per horse power per hour = 45 lbs., at	
5 dols. 25 cts. per cwt.	30 . . . 1 0s. 6½d.
Wages of engineer at 3 dols. per day	13 c. . . 1 2s. 6d.
Total cost per hour	43 c. . . 1s. 9d.

Lubricating I have left out of consideration, as in each case it is about the same. In the indirect saving in favour of the gas-engine is the reduction of 1 per cent. in the insurance rate, and the smaller cost of the engine over boiler and steam-engine. The same gentleman has also a 1½-horse power engine in his city, which he has used about 1000 feet of gas, consuming 1000 feet of gas per month; the price of gas being 2 dols. 75 cts. (11s.), to which, however, should be added the interest on the money invested (say 250 dols. at 6 per cent. per annum), 1 d. 25 cts. per month, or 30 cts. (3s. 6d.) per year, and wear and tear, making a total cost per month 4 dols. 50 cts. (18s.). No doubt that this engine effectual cost of one man's labour; allowing that it saves only one-half of this work, we still find its user gains 10 dols. 50 cts. (£2 2s.) per month. Several of the other members of the Association gave their experience with this motor, and whenever it is introduced complete satisfaction seems to be given. According to the figures produced by the gentleman, the consumption of gas per nominal horse power per hour to be, on the average, 12 feet; but doubtless many of the engines under consideration were not worked up to their full power, or the consumption would have been greater.

The transition to gas-stoves is a natural one, and it is a subject to which many of the members of this Association have given a good deal of time and attention. The success with which they have met should be a source of encouragement to themselves, and an incentive to others. Mr. Starr was able to state that with 500 dwelling-house consumers he had 500 who used gas more or less for cooking—a record that few, I think, can equal.

Again, taking the average of the figures presented by the members, and adopting 2 dols. 90 cts. (9s.) as the price of the gas, I think the expense of cooking by gas to be about 1 cent. (1d.) per head per day, with a family of four or five persons.

At the meeting of the Central New York Gas Engineers Association, Mr. Humphrey, of Dannsville, read a paper on oil gas, to which I will briefly refer, not that I approve of the process, but because, with the exception of gas, it is the only one which has been recommended by which gas is made in many of our Western towns, especially where wood is plentiful. The retorts are "throughs," 8½ by 7 inches in cross section, and 5 feet long, the inlet for the oil being at one end, the stand-pipe at the other. Into the retort a stick of hard wood is thrust, and when this is charred the naphtha stream is turned on. The oil and wood gas then passes through the condenser, purifier, and meter to the holder. In passing out to the mains, the gas is sent through an apparatus which mixes air with the gas in such proportion that when it issues therefrom it is composed of 8 per cent. of gas and 4 per cent. of air. To purify 50,000 cubic feet of the pure gas, one bushel of lime and one bushel of charcoal are required; for 1000 feet of the pure gas, 14½ gallons of naphtha and 14½ lbs. of wood are used; while for the same quantity of diluted gas, 10 gallons of naphtha and 11 lbs. of wood are required. Gas coke is used as fuel under the retorts. The gas seems to be permanent, as the superintendent says that for 23 years there has not been any condensation in the pipes. The quantity of gas is less than 2 per cent. All the work is performed by the superintendent and one man, and they are not kept continually busy, the make of gas being about 1 million feet a year.

I now come to a matter that has received a good deal of notice in some of the technical journals here. Though it occurred a few months ago, I do not think it is of much importance, but it is a matter which, on the night of the 10th of April many of the public and private lights, chiefly the former, in several cities in the vicinity of New York, went out. The cities where the lights were affected were Newark, Jersey City, New York, and Brooklyn. Newark is distant from New York about twelve miles, while Jersey City is about 10 miles distant. The gas is supplied by the East and North Rivers respectively. The morning following the night in question, the managers of the gas-works in these cities found that many of their lights had gone out during the night; each naturally ascribed it to some local trouble, and not till it was learned that several cities had drips, did they suspect a common cause. Just before midnight the New York Observatory the barometer rose suddenly at midnight—the time at which the trouble occurred—from 29.59 to 29.71 inches, and to this increase in the pressure of the air is ascribed the extinguishing of the lights. Just before midnight a sudden tornado passed over the section of the country where the trouble occurred, and it is probable that it was in one of the suburbs supplied by separate works, many of the lights went out, while in another outlying district the lights were undisturbed. In New York it is to be noted that the trouble extended, to a greater or less degree, over an area supplied by five different Companies. If this increase in atmospheric pressure explains the phenomenon, then there is a very different cause from that which the governor and the point of ignition would cause the lights to go out, for it is the pressure at the burner we have to consider, and not that in the mains; and leaving quite out of the question the specific gravity of the gas, this pressure is only about 4-10ths of an inch of water. But, for the sake of argument, I will assume that the pressure is the same, the specific gravity of the gas. Now, if we were to supply gas only to burners on the same level as the governor, I take it we should only have to apply sufficient pressure to the gas to overcome the friction in the pipes, and to cause the flame to assume its proper shape. It is to be remembered that the lights in these cities did not merely die and then go out, but were actually extinguished. If my idea is correct, the gas, having once reached the lamps, would issue from the burners by virtue of its specific gravity, even though the pressure at the works were removed. If such were the case, how would an increase of the atmospheric pressure have any effect on the lights? Would it not be the reverse? According to my idea, the reverse would be the case. When we speak of gas having a specific gravity of .450, we are comparing it with air at its normal pressure of 30 inches, which we call 1. If the barometer rises above that point, would not the gas be relatively lighter? That is, if the gas has a specific gravity of .450, and the barometer rises to 31 inches, the pressure when the barometer is at 30 inches, would it not issue with an increased pressure when the barometer rises above that point? In other words, would not the ascension pressure of the gas be greater? I confess I cannot see how this increase of the atmospheric pressure could have such an effect on the gas, and I am inclined to think that it is caused directly by the wind. The subject is of some interest, for, were such occurrences to happen with any frequency, many serious accidents might occur on account of the gas being extinguished, and then flowing out unlighted when the trouble had passed over.

THE TRANSFER OF THE NOTTINGHAM WATER-WORKS TO THE CORPORATION.

A General Meeting of the Shareholders of the Nottingham Water-Works Company was held on Monday, the 5th inst., for the purpose of winding up the affairs of the Company on the transfer of the undertaking to the Corporation. Mr. R. BURNIS, the Chairman of the Company, presided, and the Corporation were represented by Alderman Bowers and the Town Clerk (Mr. S. G. Johnson).

The Chairman (Mr. S. G. Johnson) having read the notice convening the meeting, the Report of the Directors was presented. It stated that since the last ordinary annual meeting of the Company, the Nottingham Improvement Bill had received the Royal Assent. Under the clauses contained therein the Corporation had become the purchasers of the Company's undertaking, and the transfer was made on the 14th of March. Since that date the Corporation had received in exchange for their share certificates, the Corporation annuity certificates entitling him to the following percentage annuities on the nominal amount of his shares—viz., from March 25, 1880, to March 25, 1881, to an annuity of 6½ per cent.; from March, 1881, to March, 1882, to an annuity of 8½ per cent.; and from March, 1882, to March, 1883, to an annuity of 10½ per cent. The Corporation annuity certificates entitling him to the following percentage annuities on the nominal amount of his shares—viz., from March 25, 1880, to March 25, 1881, to an annuity of 6½ per cent.; from March, 1881, to March 25, 1882, to an annuity of 8½ per cent.; and from March, 1882, to March 25, 1883, to an annuity of 10½ per cent. When the transfer was duly effected, and all the current debts of the Company had been discharged, a sum of £318 15s. 6d., remaining to the credit of the Company, was, with the undertaking itself, handed over to the Corporation; and thereupon the Corporation, on their part, handed to the shareholders a sum of £10,000 in the form of a quarterly rental earned by the Company on and before the 25th day of March, 1880, and an additional sum of £30,000 which had been offered by them in writing specifically "for the purpose of paying compensations." Nothing, therefore, remained to be dealt with by the shareholders. The last annual meeting of the Corporation was held on the 25th of March, 1880, and the Corporation had issued 554 new £50 shares, being the number limited by the Corporation Purchase Act. The Directors had paid the Shareholders the customary half-yearly instalment of dividend in respect of the profits earned by the Company up to and inclusive of the 25th of March last, for which they had received the confirmation of the meeting, and they also asked that the interim half-

yearly instalment of dividend paid by the Directors in October last, be ratified and confirmed. Since the passing of the Nottingham Water-Works Act, 1878, the Directors had carried out some important portions of the extensions thereby authorized, and had also constructed a large service reservoir in the parish of Papplewick, which was successfully completed and opened for use in March last. The revenue of the Company at the time of its transfer was in a prosperous and rapidly increasing condition, and the works were in an excellent and thoroughly effective state. The Directors recommended that a sum of £16,000 be appropriated to paying the Shareholders, on each £50 on the nominal value of their shares, a bonus of £2, and a proportionate amount for any holding of less than £50, this being equivalent to a further dividend of 4 per cent. on the total share capital of the Company. Out of the additional sum of £20,000 already mentioned, the Directors had paid £5170 in compensations to the various officers of the Company; and after paying the expenses of winding-up, and such other charges as might be payable by the Company, and were not provided for by the Nottingham Improvement Act, 1879, and making such other payments as the Shareholders might direct, the final balance would be divided amongst the Shareholders on the winding-up and dissolution of the Company, in accordance with the provisions of the Nottingham Improvement Act, 1879.

Mr. BAWSTON, in moving the adoption of the report, said it was so full that he hoped it would not be necessary to have much discussion about it. He thought, however, that he ought to draw attention to the fact that at the time when the report was prepared it was deemed to be a desirable thing to retain in the hands of the Shareholders, unimpaired, the sum of £20,000, a small sum of money as a sort of protection-fund for the interests of the Shareholders. On the more mature consideration of the Directors, however, it was thought that this looked very much like providing a fund to watch the Corporation, and therefore the Directors had withdrawn the fund altogether, throwing it into whatever balance then appeared on the books of the Shareholders. There was also another matter which he felt perfectly sure would meet with the approval of the Shareholders. He need not say that during the negotiations which had taken place between the Directors and the Corporation a great deal of trouble had been necessarily gone through by the Board, and he did not suppose that any of the Shareholders would think the Directors had done wrong in suggesting a remuneration to themselves from the rest of the fund. They therefore originally proposed that a certain sum be paid to them for compensation; but had since decided to leave the matter entirely in the hands of the Shareholders.

Mr. BAWSTON seconded the motion. Mr. BAWSTON did not agree with the suggestion in the report as to the amount of money which it was proposed should be distributed to the Shareholders; and, therefore, if that question were to be brought on as a distinct resolution, he must ask that it be understood that in agreeing to the report the Shareholders only assented to it subject to dealing differently, if they thought well, with the question of distribution to the Shareholders of the money which it came on. Another thing arose upon the report, and that was as to the compensation which the Directors had awarded to the officers of the Company. They were told that a sum of £16,000 had been awarded to the officers of the Company, and he thought it was due to the Shareholders that what was amounting to such large compensations. The amount paid in compensation on the transfer of the Leicester Water-Works from the Company to the Corporation was only £1000; the total amount of compensation paid in Derby was £2000. Mr. WILKINSON was asked to explain why the officers of the Nottingham Company were entitled to more than in these two cases, the Directors should let the Shareholders know.

The CHAIRMAN said there would be a special resolution with regard to the £16,000.

Mr. BAWSTON said that in assenting to the report he wished it to be understood that the Shareholders only assented to it subject to the settling of the amount which they would that day resolve to be distributed among the Proprietors. All that really concerned the Shareholders was the application and distribution of some of the sum of £35,000. He would like to see that printed in the report as compensation was based upon.

The TOWN CLERK said whether the £16,000 was to be applied to dispose of the whole of the balance of £30,000, or did the Shareholders propose to keep a sum of money in hand. The Directors proposed to divide £16,000 among the Shareholders; they proposed to devote £2000 to compensations; but still left a sum of over £8000 undisposed of. Supposing, therefore, a portion disposed of in favour of the Shareholders, there would still be a balance. Did they intend to dispose of that balance? because he would certainly oppose the carrying of any report which did not that day finally wind up the Company.

Mr. CHAIRMAN, with regard to the compensation of the officers, this matter rested absolutely in the hands of the Directors, and considering the magnitude of the Company, their impression was that the compensations awarded to the staff were really of a very small amount indeed. There were men who had been in their service for 45 years, and others for various periods, but no compensation had been given to any servant who had not been employed by the Company at least ten years. As to the question of the Town Clerk, in reference to whether they were going to wind up the Company finally that day, as it was impossible to know what the cost of winding up would be until the Company was wound up, they could not finally decide that day, but whatever was left would come to the Shareholders.

The motion was then put and carried.

The CHAIRMAN next moved that the instalment of dividends paid since the last ordinary meeting be confirmed. He said this was not only customary but legally necessary, and should be done.

The TOWN CLERK seconded the motion, and it was then agreed to.

The CHAIRMAN said the next resolution he had to propose was that the sum of £16,000 be divided amongst the Shareholders of the Company in proportion to their several interests in the capital thereof. The Shareholders would be asked to report that a balance remained at their disposal. It would be necessary to report the amount of the share of the expenses attending the winding up of the Company. The £16,000 he looked upon as practically a dividend on account, though it was not a final dividend. The amount he proposed would give about £2 to each share of £5, and £5. 5s. to each share of £19 5s.

The motion having been carried.

Mr. BAWSTON said that, as he had intimated before, the resolution was not satisfactory to him, and he intended to move an amendment as to the amount of distribution. The Shareholders had a sum of £30,000 to dispose of, out of which the Directors took in round numbers £3000 for compensation to officers and servants. This would leave round £27,000. He could see no necessity for any considerable amount of money being retained in hand, and he therefore proposed as an amendment—"That out of the moneys paid by the Corporation to this Company there be now distributed amongst the several Proprietors of the Company a dividend or sum after the rate of 5 per cent. on the nominal value of their shares respectively, or in the capital of the Company; that is to say, 50s. upon or in respect of each £50 share, and 17s. 3d. upon or in respect of each £19 5s. share, and that the same be paid on the 1st day of August next, to all such

Proprietors as are entitled to receive the same." This would leave a sum of something like £5000 in hand. He proposed also that the meeting of that day should be adjourned for three months, by which time all bills of costs could be made out and brought before them, so that there would be no difficulty about dividing the balance.

The CHAIRMAN said that as the Shareholders were concerned they were in exactly the same position as the Shareholders. If there was a sufficient sum left in hand to meet emergencies the Board would adopt the amendment.

Mr. GIBSON (a Director) seconded the amendment.

The CHAIRMAN said the resolution as it was before the meeting involved the distribution of £20,000, instead of £16,000, among themselves, but he objected to the adjournment for three months.

Mr. BAWSTON asked the Directors to fix their own time.

After some further discussion as to the practicability of completing the necessary preparatory work before the distribution and final meeting, the resolution was put and declared carried unanimously. Mr. BAWSTON, referring to the Directors' compensation, said he had considered the matter with the intention of doing what was strictly right to all parties concerned. He therefore proposed a resolution to the effect that out of the moneys supplied to the Company by the Corporation of Nottingham, the sum of £3000 be set apart for compensation to the Directors of the Company at the date of the transfer to the Corporation, to be applied or divided amongst them rateably in proportion to their length of service with the Company respectively during the period which had elapsed since its incorporation in the year 1845, but with certain specified variations.

Mr. GREGORY seconded the motion.

The CHAIRMAN said the subject now before the Shareholders was rather a delicate one for him to say much about. He thought that for a Company possessed of £400,000 worth of stock with a market value of something like £1,000,000, the sum of £3000 for compensation to the Directors was certainly very small indeed. However, he had said that the Directors had felt disposed to leave the matter in the hands of the Shareholders, and they would do so. Still he must say he felt some little disappointment at the amount; but if it was their will that the £3000 should be divided among the Directors in the proportion suggested in the resolution, he was in their hands, and unless an amendment was proposed he would put the resolution to the meeting.

Mr. WILD moved as an amendment that the sum of £3000 be substituted for the £2000 in Mr. Brewster's motion.

Mr. GIBSON seconded the amendment, and it was carried.

The meeting was then adjourned till the 4th of August.

THE WATER SUPPLY OF WALTON-LE-DALE.

LOCAL GOVERNMENT BOARD INQUIRY.

The Walton-le-Dale Local Board having applied to the Local Government Board for authority to borrow £10,000 for the purpose of providing a water supply for their district, Mr. R. MORGAN, C.E., one of the Local Government Board's Inspectors, held an inquiry in Walton on the 14th inst., in reference to the application. Among those present were Mr. R. CLARK, President of the Local Board, Mr. J. CLARK, Clerk, Mr. Trimble (Medical Officer), Mr. Tomlinson (Engineer), and Mr. De Rance (of the Geological Survey).

The INSPECTOR having opened the inquiry.

Mr. ASHPORT said that, as Clerk to the Local Board, it devolved upon him to supply the Inspector with any information he might desire. Plans and estimates of the proposed works had been sent to the Local Government Board, and from these it would be seen the Local Board purposed adopting a pumping scheme, and drawing the water from the millstone grit. The scheme was originated by Mr. De Rance, and this gentleman was asked to give an explanation upon it. The works were expected to supply something like 400,000 gallons per day, and Mr. Tomlinson, the Engineer, had made preparations on that basis. The population of the district was estimated at 9475; in 1871 it was 8187; and in 1861, 7383. The rateable value for highway purposes was £58,565, and for general district purposes £28,000. At present the Board had borrowed £3000 for the purpose of lighting the district, and had repaid small sum. They had also borrowed, on the security of the rates, £2000 for the erection of new offices and other buildings for the purposes of the Board. The trade of the district was mainly manufacturing, there being ten large cotton mills and print works. Agriculture was a district was without any information of the extent of what was derived from pumps, and this was of a very objectionable character. The place was as badly off for water as it could well be. Another reason why the Local Board wanted the work done was that they needed sewerage works, and they did not feel justified in providing them until they had a water supply. He might say that no gravitation scheme of supply was available. The district was of a moderately agricultural character, and the Board were afraid of the water being polluted. Under these circumstances, they consulted Mr. De Rance, and upon his advice the present scheme had been prepared. It was proposed to sink a well on the estate of Lord Chesham at Brims, which was just outside the district, and the Board had made arrangements with his lordship. The proposed reservoir would not hold an entire day's supply of water, but it was not anticipated that the district would require as much as 250,000 gallons at present. The Board would probably sell some of the water for trading purposes. A bore-hole of small diameter would be sunk to a depth of 10 feet, but the Board proposed to sink a well of larger diameter, and they would be guided by expediency in determining how far they would go down.

Mr. De RANCE said the Board would have to go down quite 2000 feet before they got to the bottom of the millstone grit, and he thought there was no question about the Board finding a spring, because they knew it was there. His idea in suggesting to the Board the sinking of the well was to obtain access to the water upon the surface of the millstone grit, and he suggested that the depth should be 300 feet or something less. There appeared to be no objection for believing that the water, when pumped, the water would stand about 125 feet from the surface. The rainfall of the locality was about 40 inches per year, and he reckoned that one-fifth of it would get to the rock. This would give an average of 820,000 gallons per day. If they reckoned one-fourth, as they usually did in these cases, they would have 1,000,000 gallons, and this would be enough to supply the district. The only unfortunate circumstance about the present boring was the occurrence of limestone; but, judging by experience, the lime which was most soluble would very soon be washed out. There seemed to be a possibility that the 12 degrees of hardness of the water would be lessened after they had got the pump some distance; but the water was not so hard as that at Canterbury, and many other places, and it was altogether free from organic impurity, as certified by Dr. Tidy.

Mr. TOMLINSON said they had pumped 60,000 gallons of water per day with a 4-inch pump in a 6-inch bore-hole, and they could not exhaust the supply at this rate. There was no opposition whatever to the scheme.

Mr. ASHPORT said there was a strong feeling in the district in favour of it, as the inhabitants were anxious to have a supply of water. The Board

proposed to borrow the money from the Public Works Loan Commissioners, and they wanted the longest possible period they could have for its repayment—say 50 years. They were prepared to commence the work as soon as the scheme was sanctioned.

The Inspector said he did not think the Local Government Board would grant more than 80 years, but he hoped to be able to send in his report on an early date, in order to expedite matters.

The inquiry then closed.

GLASGOW CORPORATION WATER SUPPLY.

A Meeting of the Glasgow Water Trust was held on Thursday, the 16th inst., when an abstract of the accounts of the Water Committee, for the year ending the 25th of May last, was presented. This gave the following particulars:

The revenue for the year amounted to	£138,993 12 0
The revenue from the river supply works was	1,903 18 0
Dr. balance from previous year	£140,897 10 0
	246 1 8
The expenditure, including annuities and interest, amounted to	£111,691 3 8
The expenditure for river supply works was	5,253 2 4
	116,944 6 0
Carried to sinking-fund account	£25,707 2 4
	15,703 3 5

Balance carried to revenue account—year 1880-81 . . . £9,008 11 6d.

The total revenue for last year was £140,897 10s., against £140,578 11s. 6d. for the previous year, showing an increase of £318 18s. 6d.; while the total expenditure for last year, exclusive of the sum carried to sinking-fund, was £116,944 6s., against £135,728 11s. for the previous year, being a decrease of £18,784 5s. The sum added to sinking-fund during the year was £51,631 19s. 6d. The sinking-fund set apart for the redemption of mortgages or annuities now amounts to £181,098 16s. 10d.

The quantity of water sent into the city and district during the past year averaged as follows:—From the Loch Katrine works, 34,088,249 gallons per day; from the Gorbals works, 3,228,122 gallons per day—altogether, 37,296,401 gallons. Average for 1878-79, 37,836,265 gallons per day—or a decrease, 389,854. The quantity of water delivered during the year from the river supply works averaged 1,624,031 gallons per day, reckoning six working days in the week. The average for the last few months, however, was about 2,270,000 gallons per day.

METROPOLIS WATER SUPPLY.

The following is Dr. Frankland's report of his analyses of the water supplied to London during June:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Colne Valley, 1·4; Kent, 1·5; Tottenham, 1·6; New River, 1·7; East London, 2·5; Lambeth, 2·6; Grand Junction, 2·9; Southwark, 3·0; Chelsea, 3·1; West Middlesex, 3·1. The Thames water delivered by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was of better quality in June than in May, but the water delivered by the Grand Junction and Lambeth Companies was slightly turbid. The Lea water, delivered by the East London Company, was somewhat superior to the water supplied by the New River Company, and the latter was of much better quality, and nearly equal to spring water. The deep-well water supplied by the Kent and Colne Valley Companies and by the Tottenham Local Board of Health was of its usual excellent quality for domestic purposes, and that sent out by the Colne Valley Company was suitable for domestic purposes, having been softened before delivered. Sent through the stratum intermedium, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; New River, clear, nearly colourless; East London, Southwark, West Middlesex, Chelsea, clear, very pale yellow; Grand Junction and Lambeth, slightly turbid, very pale yellow."

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Mat- ters.	Or- ganic Car- bon.	Or- ganic Nitro- gen.	Ammonia.	Nitrogen, as Ni- trates and Nitrites.	Total combined Chlo- rine- gen.	Total Hard- ness.
<i>Inner Circle.</i>							
Thames—							
Chelsea	25·31	131	051	0	141	192	1·6
West Middlesex	25·58	141	044	0	138	202	1·5
Southwark	25·60	138	041	0	107	148	1·5
Grand Junction	25·40	183	030	0	164	187	1·6
Lambeth	27·82	124	032	0	162	194	1·5
<i>Lea—</i>							
New River	27·96	077	023	0	176	308	1·6
East London	27·24	121	029	0	116	145	1·8
Deep wells—Kent	43·74	070	017	005	425	445	2·3
<i>Outer Circle.</i>							
Colne Valley	15·38	066	016	004	326	346	1·5
Tottenham Local Board	41·30	077	019	060	0	069	2·8
Corporation of Birmingham	25·68	196	019	002	253	273	1·9
Corporation of Glasgow	2·91	135	015	003	006	021	66

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
* Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

PROPOSED PURCHASE OF THE DROGHEDA WATER-WORKS BY THE CORPORATION.—The subject of the purchase of the Drogheda Water-Works is at present engaging the attention of the Corporation, and an offer has been made by them to the Directors of the Water Company for the purchase of the entire concern. At a recent meeting of the Corporation a reply was read from the Directors of the Company, stating that they would have no objection to arranging for the purchase of their works at a fair valuation, the expense in connection with the transfer to be borne by the Corporation. The subject will be considered at the next meeting of the Town Council.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

On Wednesday last the Shareholders of the Wick and Pulteneytown Gaslight Company held their annual meeting—Mr. Henderson, of Bilbster, in the report by the Directors for the past year it was recommended that a dividend of 5 per cent. be paid to the holder with a bonus of 2s. per share, and regret was expressed that the Directors had been unable to make a reduction in the price of gas in consequence of a large expenditure made during the past year, and which they contemplate making during the ensuing year on their works. They looked forward, however, with confidence to a substantial reduction being made at the next annual meeting, and not improbably at an earlier date.

At the annual meeting of the Nairn Gas Company, held on the 19th inst., a report was submitted from the Directors recommending the payment of a dividend of 5 per cent. It was stated that the past year had not been a favourable one for the Company, as they had had to bear a considerable loss from damage to the street-mains, caused through drainage operations. The report was unanimously agreed to.

The Shareholders of the Montrose Gaslight Company held their annual meeting last Wednesday—Mr. Francis Aberdeen, of Keithloch, Chairman of the Company, presiding. The Secretary and Treasurer (Mr. McNeill Watt) read an abstract, and thereafter the report of the Directors, which stated that the extensive additions and alterations which have for some time been in progress at the works would soon be completed. A recommendation by the Directors that a dividend be declared at the rate of 7½ per cent. on the shares (valued at £40 each) was approved of. Mr. C. Durie moved that a balance-sheet be printed and circulated annually amongst the Shareholders, as was done by other Companies. Mr. John Reid, late Manager of the Leith Gas-Works, and a former Manager of the Montrose Gas-Works was present, and said that it was not usual for gas companies to do so. The books were opened, and the Directors were invited to look at them, and he suggested, seeing there was a probability of the works being acquired by the Town Council, that no action should be taken in the matter. Mr. Durie's motion was not seconded, but it was left to the discretion of the Directors to print a balance-sheet if they saw fit.

The four retiring Directors were elected for the ensuing year. The Gas Commissioners of Kirkintilloch had their accounts for the past year under consideration at their monthly meeting. The statement made showed that during the two years that the works had been under the charge of the Commissioners there had been a gross profit of £10,000 to £12,000, and, after paying £200 for the purchase of the works, there was a net profit of £200 remaining. It was agreed to use the major portion of this sum in reducing the price of gas from 5s. to 4s. 7d. per 1000 feet. Provost Sandeman, in moving that the accounts be accepted and printed, called attention to their very satisfactory position, and expressed his pleasure at the prospect of being relieved from a legitimate surplus. It showed the care with which the accounts of the works were managed by the Gas Committee, and he hoped the inhabitants of the burgh would appreciate their services. He moved a vote of thanks to them. It was agreed to make an increase in the salary of the Manager (Mr. Duncan Jeffrey).

On submitting the annual financial statement of the Johnstone Gas Commissioners to the last monthly meeting of that body, Provost Donald drew attention to the pleasing fact that they were in the position of having a surplus, after paying all the expenses of the past year, amounting to £510 15s. 6d., which was, he said, a larger balance than their predecessors ever had, and he thought the Manager of the works (Mr. Wylie) should be complimented for what he had achieved in the face of so many disadvantages. He concluded by calling the attention of the Commissioners to the necessity of introducing some new machinery, in order still further to increase their profits. In reply to one of the commissioners, he remarked that there was not any likelihood of the price of gas being raised, and he thought that by another year they could have a slight reduction.

In submitting the annual statement of accounts at the last meeting of the Port Glasgow Town Council, Provost Sommerville, on the part of the Gas Committee, spoke in congratulatory terms as to the management of the works, and the soundness of the financial position of the same. The Committee, endorsed the remarks made by the Provost. He said the members of the Council were aware that in 1875 it was considered necessary that, if possible, certain alterations should be made to work out some improvements, and, if possible, leave the balance on the right side. A great deal of time and money was spent on the alterations, and at the end of 1878-79 there was a suspense account of over £234. From the balance shown this year they had met the suspense account to the extent of £164, and were now to the good somewhere about £311. Not only so, but through the great care of their Superintendent at the gas-works the leakage had been much reduced. In 1875 the amount of leakage was amongst the highest, he dared say, of any gas-works in Scotland, running somewhere about 25 per cent. He was very glad to be able now to inform the members that it was reduced to about 15 per cent. Some of them would recollect that at a previous meeting it had been said that if they turned the leakage into money, there was a certain sum lost year by year. If he were taking such a basis for his calculations—which they all knew was an erroneous basis—he would say that they had saved from £2950 to £2600 this year in that way. He expressed his belief that the leakage would be still further reduced.

Considerable progress has been made in connection with the question of unaccounted-for gas in Greenock, and the Corporation Gas Committee confidently anticipate that, when the adjustments are completed which are at present in progress, they will have a different tale to tell at the end of twelve months to the credit of the gas-works.

The meeting of the Glasgow City Council, in its capacity of Gas Commission, was held on Monday, the 12th inst.—Provost Shortridge presiding. Gratifying reports were submitted as to the result of the past year's working. The total receipts had amounted to £8971 19s. 3d. This enabled the Committee to pay off a balance of £1006, which stood at the credit and largest debt of the Corporation, and to pay on the loan, and a further instalment of £625 towards the repayment of principal; then set aside a sum of £150 for the establishment of a depreciation-fund, and to carry forward a balance of £492 16s. 6d. to the credit of the profit and loss account, which they recommended should be applied to the reduction of the price of gas. A large sum was also expended in a saving of £1961 had been effected in the quantity of coal carbonized, while there had been an increase in the gas-rental of £1040. On the motion of Treasurer Lennox (Convener), seconded by Mr. Paterson, it was resolved to reduce the price of gas to all consumers from 5s. 10d. to 5s. per 1000 cubic feet. A list of names of business and domestic consumers, and smaller sums to several of the other officials employed at the works.

At the annual general meeting of the Lockerie Gas Company, held on Monday, the 19th inst., the annual dividend was declared at the rate of 7 per cent., being the same as at the previous annual meeting. The report of the Directors for the past year was read, and the Glasgow pig iron market during the past week, and the close on Friday was the highest point touched—namely, 5s. 9d. cash, and 5s. 10½d. one month for buyers. There is still an abundance of improvement in the coal trade.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Except that the demand for pig iron has now fallen has a tendency to restrain the almost reckless pressure for sales which has been going on for some time, there is little change to notice in the coal trade of this district. There is no material increase in the requirements for consumption, and the belief seems to be entertained by many of the colliery proprietors that a strike, if one can be got to, would do more to the market by a considerable reduction of the output. There is no question that the present means of production are far in excess of any probable requirements for some time to come, and the effect which this will naturally have in keeping down prices has, no doubt, influenced many sellers in the long forward tender for gas coal contracts which have recently been made.

With regard to this branch of trade, contracts are being based upon tenders for deliveries extending over three years at extremely low figures, and in other classes of round coal, buyers who are prepared to take quantities are able to command pretty nearly their own terms, the market both for gas coal and manufacturing purposes, being of a very limited description, with needy holders of stocks anxious to secure orders at almost any figure. It is scarcely possible to quote any really fixed market price, as there is a great deal of private bargaining for anything like sales in bulk; but so far as any quotations can be given, they are about as under: Good screened round coal, 7s. to 7s. 6d.; second, suitable for house fire or gas purposes, 5s. 6d. to 6s. 3d.; and common screened coal for steam purposes, 4s. 6d. to 5s. per ton. For engine fuel the market is generally steady at late rates, there being no pressure to sell slack. For bulky prices range from 3s. 9d. to 4s. 3d. per ton at the pit.

In the shipping trade there is very little doing, and Lancashire steam coal delivered at the ports on the Mersey is being offered at from 6s. to 6s. 6d. per ton.

The improvement in the iron trade continues, prices being very firm with an upward tendency, although the actual sales do not yet largely increase. Lancashire makers of pig iron have indeed, if anything, been doing less than they advanced their prices, but some fair quantities of iron could have been sold at previous rates. Local makers, however, are holding for 50s., less 2s. for No. 3 foundry; and 49s. for No. 4, forged, delivered into the Manchester district. Fine iron is getting to be rather busier, and there is less pushing for orders at under list rates; but bars delivered into the Manchester district can still be bought at about 46 per ton.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

During the past week the coal trade of this district has been fairly active, though not to anything like an unusual extent, or to such a degree as to warrant belief in the minds of colliery owners that the brighter aspect which we agreed to alight to in our article of the 13th inst. will be very speedily extended to them. Things, however, are decidedly more satisfactory than they were a month back, inasmuch as the practice of underselling then prevalent is but little complained of, and competition on the part of neighbouring producers is less keen. Scarcely any of the local pits are in the market for sale, and the iron trade, as far as those who are best off for orders. A steady trade at slightly improved rates is nevertheless maintained, and notwithstanding the persistence of those who continue to speak in the most despairing manner of the local trade, business is, on the whole, better than has been depicted. During the months of April, May, and June, several firms were busy, and whereby a perceptible reduction in the demand was noticeable. Importations were, however, cut off in a similar ratio, and the coalowners were less sufferers than were the ironmasters. Should the greatly improved prospects in the latter department continue, the demand for furnace and foundry coal will be greatly extended. For best domestic coal, orders are as numerous as they have been for several months past. In the Cannock Chase district efforts are being made to secure a better agreement on the part of the men for the ensuing part of the year, than that which expires on the 15th of next month. By the old agreement the wages of coal hewers given will be withdrawn after that date. The wage rate, it is held, should be based on the actual selling price of coal. By the last agreement it was based on the minimum—viz., 2s. 3d. per day on the average price of 8s. per ton for best deep and shallow coal.

The last week's iron markets were well attended, and a cheerful business was done. Quite a number of inquiries were made, and for all kinds of finished iron inquiries were numerous. Merchants show a disposition to secure parcels at the advanced rates, though the prices of the previous week were fought for. An increase of 2s. 6d. and 5s. over those prices was maintained. The ruling price for forge pig iron is 10s. to 12s. above the rate of a month ago, and Staffordshire bars (common run) as much as 4s. and 5s. over the prices of those then quoted. All kinds hot-air pigs are 5s. higher than they were a fortnight back, and part-mine have increased in like manner. Most makers now have a good stock of orders on hand, and there is every probability of the mills going full time for several weeks to come.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

During the past fortnight great changes have come over some of the collieries in the South Yorkshire coal-field; owing to the alterations made about the contracts for various quantities of gas and engine fuel. The pits scarcely ever vary more than they do at the present time. Many collieries are working short time, making, in fact, one and two days per week; whilst at Wharfedale Silkstone, Darfield Main, Carlton Wood, Lundhill, Monkton Main, and other places, five and six days a week are now being worked.

The house coal trade in both the South and West Yorkshire districts is very moderate indeed, and in addition to the slack trade prices of both Barnsley and Silkstone house coal are very low. The tonnage trade to London is still the subject of conversation, and it is said the example of the East Derbyshire coalowners, who are followed by the Yorkshire proprietors, who will endeavour to prevail upon the Great Eastern or some other railway company to come into the district. There is only a limited demand for coal for Lincolnshire, the Eastern Counties, and other markets to which house coal is usually sent.

In both districts the quantity of coal produced is just now pretty large, the exports from the various Humber ports holding well up. A good deal of hard coal has of late been used for smelting purposes; but the demand is not quite so good. Locomotive coal is, for the most part, supplied on account of contracts to the various railway companies. Some of the pits seem to have fairly good orders, but the quantity of supplies were secured prevents much profit being made even at collieries where the royalties are low, and the owners have extra advantages.

The coke trade is beginning to flag, and it is rumoured that some owners will be put out. There is, however, a very large output at most places in South Yorkshire, several of the leading firms having close upon 100,000 tons each at work. In the face of the somewhat quiet trade, many colliery owners are still pressing on with the erection of new works which were

commenced before the slackness was visible. The furnaces in the North Lancashire iron-smelting district are taking a good deal of what is produced in the locality, but the blowing out of furnaces indicates that a further falling-off is almost certain. Prices, it may be stated, are lower, but a large proportion of what is sent away is supplied by contract.

As mentioned in my last report, the low prices which prevail, coupled with the very quiet state of the trade, are causing coalowners to revise their working expenses with a view of decreasing their outlay. At several places, including the Barrow Colliery, Stratford Main, and Stanhope Silkstone, the men, or a portion of them, are either under notice or have been discharged. The workmen employed at the Barrow Colliery are given to understand that the firm will close a greater part, if not the whole of the colliery, they being able to procure fuel cheaper at their works at Barrow than they can send it from their own pits. Should this step be taken, it will seriously affect the district, the owners having quite recently erected close upon 400 houses for their workmen. The opinion of some persons is that the owners are proceeding in a very untheoretical aspect, but no alteration can be noted in the extra demand required. The production of pig iron has not diminished to any great extent, there being a full complement of furnaces in blast. Orders are, however, not pushed forward with the energy which was displayed during the early part of the year. The mills and forges are not over-worked. There is a fair demand for heavy castings, but for lighter material the inquiry is very moderate. With regard to the Bessemer steel trade, the works in the South Yorkshire district are kept well employed; but ordinary foundry work is not over plentiful.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There is no special change to note in the position of north country coals. Tonnage has rather run short for the Baltic, and merchants have difficulty in placing orders. The Baltic gas companies, and the agents of the shipping companies, and the prospect of a business home are highly unsatisfactory, it is probable that they will have to pay more in freight. Very little business is transacted coastwise. The principal shipments continue to be done by the gas colliery steamers and the large vessels owned by gas coal contractors. The coal owners find it impossible to maintain normal rates. Nominally they are only able to do so, as reductions are made in discounts. Prices of steam coals are about 6d. down. Best steam is not higher than 9s. per ton, less 2½ per cent.; but some collieries give 5 per cent. The prospects of the Northern coal trade for the autumn are very moderate indeed. The price of gas coals is unchanged. Second-class pits, in some instances, only work short time, and do a sort of irregular business. Coke has improved a trifle, but any upward tendency in prices is not very manifest. There is a better inquiry for small and manufacturing coals.

The freight market is extremely easy coastwise for gas coals, and very low for small and manufacturing coals. Country gas works will not import any great quantity of seaborne coal until the conclusion of the wheat harvest, when cartage is more at command. Scarcely any steamers were engaged last week for London. Freights were low. Boats were not wanted for the North of France, and very little tonnage is being taken up by the Irish gas works to load from the Clyde.

The Cleveland iron trade sustains recent improvements very satisfactorily. Lead is in better demand, and stronger in price. The importation of wood into the North of England is a moderate average. Prices remain steady, but an advance cannot be anticipated.

The chemical trade of the North of England was very firm last week. Prices advanced 2 or 3 per cent. Stocks are low, and there is every prospect of an improved trade, as the market keeps strong in Liverpool.

BELPER WATER-WORKS COMPANY.—The ordinary half-yearly meeting of this Company was held on Wednesday last—the Rev. R. L. Lloyd in the chair. The report of the Directors presented showed a balance of £29,385 10s. 6d. in hand, and it was agreed to pay the Dividend of £1,000, which has been in existence for 20 years, now declared its first dividend, which was at the rate of 5 per cent. for the past half year.

THE PAYMENT OF DIVIDENDS FREE OF INCOME-TAX.—At the last meeting of the Shipley Local Board, it was resolved to try the question of the legality of the Directors of the Shipley Gaslight Company paying dividends free of income tax. The Board has taken the matter into consideration, and the amount of the fees paid to the Directors, which it was stated came to £500 a year, the profits divisible among the Shareholders being only £3100.

SUGGESTED PURCHASE OF THE FOLKESTONE WATER-WORKS BY THE TOWN COUNCIL.—At the meeting of the Folkestone Town Council last Wednesday, on the Finance Committee recommending the payment of certain accounts—among others that due to the Water Company—the Mayor called attention to the large amount of it, and said he felt that the time had now come when the Council might seriously consider the question of purchasing the works. He believed a great saving would be effected if they had the control of the water supply in their own hands; and he gave notice that at the next monthly meeting he would call attention to the subject.

PAISLEY CORPORATION WATER SUPPLY.—The annual meeting of the Paisley Water Commissioners was held on Thursday, the 15th inst., when it was reported that the income for the year ended the 15th of May last was £12,129 7s. 9d., while the expenditure was £14,146 18s. 6d., showing an excess of expenditure over revenue of £2017 10s. 6d. The amount of water collected for the year was 1,000,000 gallons, and the rate was 5s. 4d. The amount collected in Johnston and Elderslie was £1173 10s. 10d. The Committee agreed to recommend the Commissioners to continue the same rate as last year, which was 8d. in the pound for the domestic rate, and 1d. for the public rate. To defray the cost of the Glenburn and Upper Glenburn waterworks they agreed to recommend the Commissioners to borrow £9000. The report was adopted, and its recommendations agreed to.

STOWMARKET GAS SUPPLY.—The *Suffolk Chronicle* says that the Directors of the Stowmarket Gas-Works, who recently invited tenders for leasing or selling the property, have accepted the tender of the former leaseholders, for a term of 15 years at an increased rental of £5000 per annum, and a rental of £335 per annum. This, with interest on about £1900, the sum awarded by the valuers to the lessees for improvements and extensions made during their last term, brings the total rental up to £430. The Local Board of Health who offered £6000 for the works subject to a small portion of the last year's rental being added to the new rental, £4300, have lost, in the opinion of many, a good opportunity of benefiting the gas consumers of the town, both as to lessening the cost of gas and applying the surplus to reducing the rates. It may be added, on the authority of a statement made by one of the Directors, that they would have probably been able to add £2500 to the new rental, had it been accepted. As it is, however, the arrangement brings the Shareholders 5½ per cent. clear.

WASTE OF WATER IN PENZANCE.—At the meeting of the Penzance Town Council on the 14th inst., the Sanitary Committee reported that an

inspection of water-taps and fittings in the town had resulted in reducing the consumption of water in one district from 80 gallons per head per day to 40 gallons, in another from 60 gallons to 30; and that as soon as possible the meters are to be removed, in order that the consumption in other districts may be tested. As James, who moved the adoption of the report embodying these facts, remarked that the present consumption of water was greater than the Council could afford, and unless the inhabitants assisted the Sanitary Committee by the greatest possible economy, it would be their disagreeable duty to give an intermittent supply every day. Mr. Coulson said that recent stringent inspection of fittings had resulted in a saving of 100,000 gallons of water daily, and more than 100,000 gallons could be saved in districts not yet inspected. With proper economy there need never be any fear that the water supply of Penzance would fall short.

THE SEWAGE OF PARIS.—It may be remembered that for some considerable time past the question of the disposal of the sewage of Paris has been under the consideration of the Municipal Council. Various schemes of chemical and other—having been tried for dealing with the refuse, but with not altogether satisfactory results, it was eventually determined, on the recommendation of M. Alphand, the Director of Public Works (whose report was given in the JOURNAL, Vol. XXXV., pp. 62, 98), to adopt an irrigation scheme on a tract of land at Gennevilliers, and to further convey the sewage to St. Germain for final treatment. Towards the end of April last the members of the Municipal Council, accompanied by M. Alphand, made an inspection of the locality and the works, of which it may be presumed they expressed their approval, for we learn that at the meeting of the Council on the 29th ult. it was resolved to apply for the continuation of the irrigation system in the fields of Gennevilliers, and the carrying of the sewage to the lower north-western part of the peninsula of St. Germain and adjoining farms, and the delivery of the sewage from the conduits to persons on their routes who shall be willing, by agricultural, chemical, or other means, to cleanse it to their own expense and risk for the sake of what they may be able to get out of it, subject to rules to be prepared; secondly, to ask the Government, in case the 1500 hectares (3700 acres) of land at present employed might be found insufficient for the purification of the sewage without annoyance to the neighbourhood, to take into immediate consideration the extension of the present proposal and the irrigation of other districts in the Valley of the Seine.

SIR WILLIAM HARCOURT as CHAIRMAN of the SELECT COMMITTEE on LONDON WATER SUPPLY.—The *Evening Standard* of the 19th inst. contained the following:—"The fretful porcupine is always delighted to seize the opportunity of sticking his quills into the unoffending traveller, and is often only making but foolish use of the porcupine to blame the traveller, and be rude to him because that victim dislikes to be so pricked. In this allegory Sir William Harcourt is the porcupine and Sir Edmund Beckett, Q.C., the traveller, and the little encounter took place in one of the committee-rooms of the House of Commons at the end of last week. Sir Edmund had the misfortune to be before a Committee to answer a question of the Metropolitan Water Companies, of which Sir William Harcourt was Chairman, and, to use a sporting phrase, it was 'long odds' on the Chairman offending or vexing some one in the course of the inquiry. The discussion turned upon the figures and statements prepared by one of the principal witnesses, Mr. Smith, and as these figures had a tendency to prove that Sir Edmund's opponent desired the contrary, they not unnaturally set down Mr. Smith as ignorant, incompetent, and generally untrustworthy. Sir Edmund defended Mr. Smith, and after having spoken—and that very much to the point—for some hours, was interrupted by the genial and always agreeable Home Secretary, who observed that 'he hardly thought that Sir Edmund Beckett could have taken the trouble to read the evidence.' Now, it was Sir Edmund's bounden duty to be familiar with the evidence, and of course he was familiar with it; but that made Sir William Harcourt's sneer none the less offensive. Sir Edmund—the unoffending traveller—however, contented himself with simply replying, 'I read it, I read it,' whereupon Sir William Harcourt—the fretful porcupine—severely replied, 'Go on, and I expect you will treat us with respect.' As Sir Edmund perceived that he had to deal, not with Sir William Harcourt personally, but with the Chairman of a Parliamentary Committee, he forbore to retort, and succeeded in coming up to the Home Secretary's expectations in matters of fact. If Sir William Harcourt desires to be 'treated with respect,' however, it would not be by any means a bad idea if he began by showing some sort of respect for other people. The incident suggests the story of the Judge who, having made an unwise observation at which one of the barristers in court half unconsciously shrugged his shoulders, asked

whether the learned counsel desired to show contempt for the court. 'Show contempt, my lord! Certainly not,' the counsel replied. 'On the contrary, I am trying to hide my contempt—but it's a very trying business.' Doubtless Sir Edmund did his best to show respect for Sir William Harcourt.

PRESENTATION of TESTIMONIALS to Mr. G. A. ROBINSON, of LEICESTER.—A testimonial having recently been presented to Mr. G. A. Robinson, on his resignation of the appointment of joint manager of the Leicester Corporation Gas-Works, by the clerks and workmen employed at the gas office and at the works, the *employees* in the Gas-Fitting and Fittings Manufacture Department, for so many years conducted by Mr. Robinson in conjunction with his brother, Mr. C. S. Robinson, were desirous of presenting him with some token of the respect and esteem which they entertained for him. Accordingly, an address, engrossed on vellum, beautifully and artistically illuminated, and placed in a richly moulded gilt frame, was forwarded to Mr. Robinson for his acceptance, together with a handsome Russia leather cigar-case, with silver fittings and monogram. The address was as follows:—"To George Alfred Robinson, Esq.—Dear Sir, We, the *employees* of your Gas-Fitting and Fittings Manufacture Department have heard with regret that you retire from the business. We cannot let the event pass without an expression of our sorrow at your leaving us. We could have wished it had been otherwise, for the kindness you have at all times manifested towards us. However, dear Sir, permit us to tender this address as a token of the esteem in which you are held by us, and of our wish for your welfare; and we sincerely trust that you may live many years to enjoy your retirement, knowing, as we do, the useful work for the benefit of others to which you are attached. We also hope the blessing of God may rest upon you, and that when you look at this address it may bring to your remembrance the affection which the subscribers to the same have always felt for you." On the following day Mr. C. T. Hobson, foreman of the department, received from Mr. Robinson a reply to the address, in which he said:—"I cannot allow my duty to pass without conveying, through you, to the *employees* of the Gas-Fitting and Fittings Manufacture Department my most sincere and hearty thanks for the very handsome illuminated address which was forwarded to me yesterday. Much, however, as I admire the exquisite taste and beauty of its execution, I value far more highly the kindly words of which it is composed, and the kindly feeling which I know dictated its gift. It is most gratifying to feel that in closing my business connection with you all, I carry so many good wishes for the future."

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 2953.—BARBIER, N. F. D., Paris, "Improvements in automatic luminous buoys." July 17, 1880.
2963.—IMRAY, J., Chancery Lane, London, "Improvements in the treatment of the liquor for the production of ammonium sulphate." A communication. July 19, 1880.
2964.—IMRAY, J., Chancery Lane, London, "Improvements in apparatus for distilling ammoniacal liquor." A communication. July 19, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

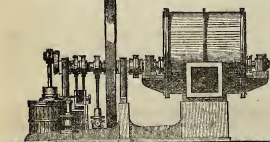
- 289.—LARK, W. R., Southampton Buildings, London, "Improvements in apparatus for automatically lighting and extinguishing gas." A communication. Jan. 22, 1880.
772.—MATTHEWS, C. R., Drury Lane, London, "Improvements in fixing, connecting, and disconnecting gas pendants, brackets, pillar or ground connections, especially adapted for outside reflecting lamps." Feb. 21, 1880.
1478.—MANN, W., Gunnersbury, and WALKER, W. T., Highgate, London, "Improvements in apparatus for the purification of coal gas." April 10, 1880.
1876.—SAMPSON, J. L., North London Iron Works, London, "Improvements in or connected with apparatus for lighting or illuminating with gas." May 7, 1880.

PATENT WHICH HAS BECOME VOID

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.
2177.—HUNTER, A. G., "Improvements in apparatus for the manufacture of gas for illuminating and heating purposes." June 21, 1873.

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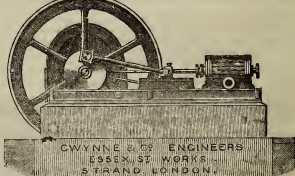
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TO CORRESPONDENTS.

J. S.—Shall most likely have room for report in next issue.

R. K. M.—Not suitable for publication.

ORZ ANXIOUS.—You have probably let a little tarry vapour into the purifier, and this has accumulated on the bearing bar, and been fired by the heat generated in the spent lime when air was admitted on opening the purifier lid.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.—We have pleasure in acknowledging the receipt of a copy of the report of the proceedings of this Association, held at Boston last February.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 3, 1880.

Circular to Gas Companies.

THE possibilities in relation to gas supply which are from time to time, being opened out to us, have received a remarkable development during the past week through the action of the Leeds Gas Committee. As intimated elsewhere, that body have resolved still further to reduce the already low price at which gas is supplied in Leeds, and they will accordingly recommend to the Town Council that the charge throughout the wide area which they supply shall be 1s. 10d. per thousand feet from the 1st ult.—a reduction of fourpence per thousand feet from the price charged during the past year. A further discount of 2½ per cent. will be allowed for payment within one month of delivery of the half-yearly account. The quality of the Leeds gas would appear to vary inversely with the price, for while a few years ago we had to report frequent complaints, both as to the quality and quantity supplied to the consumers, the price being rather higher than the average of neighbouring towns, there appears to be now no complaint as to the abundance of the supply, and the quality has been raised to seventeen candles, as tested by the "London" burner. Such terms and conditions, we need hardly inform our readers, are more favourable to consumers than any previously recorded, and the case appears the more remarkable when we remember that four years ago the price was 8s. 9d. per thousand feet, and that in 1874 the Gas Committee were accumulating a handsome deficit at that figure. It is a pecu-

liarity of the Leeds Gas Committee that they do not wait for the publication of their accounts before determining the prospective price. The Engineer is instructed to prepare an independent estimate of the probable cost for the ensuing year, and upon this the Committee act. We understand that in the estimate so prepared, Mr. Henry Woodall has calculated upon an increased sale of 100 million feet, which is equivalent to nine per cent. The increase last year was at the rate of more than ten per cent., and the anticipation for the current year is therefore not an exaggerated one; indeed, we cannot but consider that such circumstances as those provided by the Leeds Gas Committee will serve as a sufficient stimulus to consumption, and cause the use of gas to be extended to an unusual degree. What such a stimulus amounts to may be illustrated by the fact that the user of gas as a motor in Leeds, paying say £300 for an engine, is placed at least on a par with a consumer in any town where 3s. per thousand feet is charged, supposing the latter to receive his engine as a gift. Especially in a manufacturing town like Leeds, there can be no doubt as to the superiority of the policy there pursued to that of those Corporations who make large profits out of the gas consumers, and hand them over for the benefit of the ordinary ratepayer. In these days of keen competition and small manufacturing profits, it is not at all difficult to conceive a very important influence being exerted upon the fortunes of a town by such a policy, especially as the general introduction of gas-engines is making cheap gas almost synonymous with that most potent instrument for good—cheap fuel. We do not doubt that this action on the part of the Leeds Gas Committee will cause serious inconvenience to those Corporations who desire to continue the pleasant but vicious practice which we have so often condemned, and we shall heartily rejoice to see them following the good lead now set them. If this is generally done, the present conflicting aims being reduced to the simple one of making and supplying gas as well and as cheaply as possible, they will then be able to contend on even terms with Gas Companies for the honour of the foremost place, and the present position of the Leeds undertaking may well encourage them to expect success. It will be generally interesting to know the details of the economies that have enabled the Leeds Gas Committee to effect the considerable and continued reductions in price of the last four years, and we shall be glad, if possible, to lay the same before our readers.

It will be remembered that a quarrel which had long existed between the Corporation of Exeter and the Exeter Gaslight and Coke Company culminated, in the summer of 1878, in a proposal for the transfer of the undertaking of the Company to the Corporation, which, however, was not ratified by the ratepayers, who, on being polled, rejected the proposed bargain by such a majority as to destroy all hopes of any arrangement of the kind being effected for some years at least. The result of the poll was a surprise to the majority of the Town Council, who had run up certain preliminary expenses, usual in such cases, relying on their action being supported by the ratepayers. But, as the event proved, they found themselves in the exceedingly awkward predicament of having to face a bill of costs which the Local Government Board declined to recognize, and which any single ratepayer might, by taking legal action, prevent being paid out of the rates, as having been illegally incurred, leaving it to be surcharged upon the disappointed town councillors personally. We can quite understand that the regret naturally felt by the members of the Council at having failed to carry a pet scheme must have been distressingly intensified by the further reflection that they might have to pay heavily for the mistake into which their zeal had led them. At a recent meeting of the Council, the Finance Committee—having been threatened with proceedings in the Queen's Bench Division of the High Court of Justice if they passed the Town Clerk's bill of £438 6s. 11d., being the amount of his own and the Parliamentary Agent's costs in the matter of the illegal arrangement with the Gas Company—brought the whole question forward for decision by the full Council, and we do not think the action finally taken reflects much credit on the collective wisdom or fairness of that body. In the course of discussion, some reflections were made on the conduct of the Town Clerk for having neglected to ascertain the wishes of the owners and ratepayers until December, 1878, when the decision of the Council had been given in July—the costs being incurred in the interval. The Town Clerk disclaimed having neglected his duty, and explained that the delay was not his fault; but finally offered to give up his own share of the bill of costs (amounting to a little over £100) if the Parliamentary Agent's claim were allowed. This offer was accepted by the Council, a minority still, how-

ever, protesting against any part of the bill being charged on the rates. In this unsatisfactory affair nobody shows to advantage except the Town Clerk, whose surrender was, it must be confessed, an act of weakness. He should have stuck to his bill, as having been incurred by order of the Council, leaving them to meet the legal difficulty as best they might. The Council, on their part, should have had the courage to face the ratepayers, individually or collectively, in defence of proceedings conducted *bonâ fide*, and, as they believed, in the ratepayers' interest; and so have ordered payment of the bill, instead of endeavouring to shelter themselves behind the Town Clerk's liberality, or feebleness, as it may equally well be called. But having shown this willingness to victimize their paid officer, and in so doing to lighten their own responsibility, it will be but suitable retribution if, after all, the considerable balance of the bill should be left to be settled among themselves.

The question of the rate of hire of gas-stoves in Leicester is not to be allowed to rest at the point where we left it a few weeks since, when the Chairman of the Gas Committee thought he had finally disposed of it in his speech at a meeting of the Town Council. This time the persons who considered themselves principally aggrieved—some thirty-six gasfitters and ironmongers, who are also ratepayers—have presented a memorial to the Council, asking for some restraint to be imposed on the action of the Gas Committee in letting stoves on hire on terms which not only prevent the local traders from doing any business in such articles, but also fail to repay the Committee for their outlay. The latter is really the more important allegation of the two, although it was probably introduced as a mere make-weight by the framers of the memorial. We have already in these columns expressed our opinion on the general subject, and have nothing to add to it on the present occasion. We hold that no consideration of expediency can warrant a public or private trading corporation in making a heavy profit (or a loss) on accessories necessary to the consumption of the staple commodity which they sell. From neglect of the salutary rule that "every tub should stand on its own bottom," come many and widespread evils. In the case of Leicester, the harm done to the local traders is probably of small extent, since it may safely be assumed that if the ordinary traffic in gas-stoves had been of any importance, the extraordinary action complained of would never have appeared necessary in the opinion of the Gas Committee. But, on the main principle, that action stands condemned by the words of its chief advocate. To charge a rental of ten per cent. on the prime cost of an article which costs five per cent. annually for repairs—thus leaving a bare five per cent. to pay for interest on capital, cost of supervision, and depreciation—is hardly a common-sense proceeding. Yet such is the avowed practice of the Leicester Gas Committee. Whatever may be the advantages the use of gas-stoves can be proved to possess—and we do not for a moment dispute that they are many—they would remain but little affected, as regards the gas consumers, if the Committee were to charge such rent for their use as would leave sufficient margin to cover all possible expenses attending their purchase and maintenance. Giving the Committee credit for their intentions, which are to popularize and extend the use of gas, we still maintain that the way they have chosen for doing it is a wrong one. But the error is not of any magnitude; and, if corrected, the clamour against interfering with private enterprise may be unnoticed, since any spirited tradesman, by offering equally good articles at a suitable discount for cash, may underbid the Committee, without incurring their displeasure, as, in any case, their own ends would be served. A publication, circulated in the town, in which the general management by the present Gas Committee of the valuable property committed to their care is seriously impeached, may perhaps have appeared in connection with the gas-fitters' revolt, although the affair of the stoves is only incidentally mentioned in it, and then merely to sustain a bad argument. In this statement we are told that the receipts from gas and meters barely cover the cost of manufacture and distribution of gas, and interest on borrowed money; hence the sole source of profit available for relief of the rates is the sale of residuals, which are stated to bring in only £20 on the capital employed per million feet of gas in Leicester; while in Birmingham and Nottingham the returns on the same basis are £27 and £30 respectively. Hence it is argued that it is folly to seek to develop the sale of gas while the profit from residuals is so much below what it ought to be. Now, in the first place, although it is just possible that the Leicester Gas Committee do not make the best of their residuals, no one with any knowledge of the con-

ditions involved would, on the other hand, contend that one gas-works should always realize as much by the sale of residuals as another works in different circumstances. Then, again, to give up all efforts to push the sale of gas by legitimate means because the revenue from it, taken arbitrarily by itself, barely covers the total charges of the establishment which produces it and other things besides, would be the counsel of a lunatic. Has it ever struck the ingenious framers of this argument, who also want to see so much "profit" made out of gas consumers for the benefit of ratepayers, that the best way of helping both classes of the community would be to make them amalgamate as far as possible, by so reducing the price of gas, and helping its general consumption, that the great majority of ratepayers should eventually also be gas consumers? If not, we would commend this as fit food for reflection to them and their fellow-townsmen, with the full assurance that if they will only carry it out, the great question of gas will from thenceforth cease to trouble their minds.

The action taken by the Corporation of Hanley, through their representative in Parliament, of opposing the third reading of the British Gas Bill, was unusual, and therefore invited the very grave objections which were urged against it in the House of Commons. Very rarely indeed has it been found that the many stages through which a Bill has to pass in its process of development into an Act of Parliament have not been sufficient to open up everything in it to which exception need be taken. This being so, although the issue cannot be satisfactory to both sides, the proposition at the last of those stages—usually a purely formal one—to cast aside the previous work of the Houses and their Committees, needs to be supported by arguments of unusual force to save it from emphatic condemnation. The opponents of the British Gaslight Company had been heard in the House of Lords, and the Committee of that House had, while passing the preamble of the Company's Bill, themselves made certain alterations in the clauses, the opponents declining their aid in the consideration of them, lest they should be prevented from opposing the preamble in the Commons. When the Bill reached the Lower House, and before it was referred to a Committee, the Company took exception to the *locus standi* of the Corporation. They maintained before the Court of Referees that their Bill was simply one to enable them to raise further capital, and not to vary the powers or conditions under which they conducted their undertaking, and that the Court had laid down the rule that *locus standi* should not be allowed to opponents of simple money Bills. This view was approved by the Referees, though with some apparent reluctance, and the Bill consequently went through the Commons as an unopposed one. Now, under these circumstances, it is hard to condemn the action of the Hanley Corporation, because it is to us impossible to approve the rule under which they were refused a hearing. With what object does Parliament limit the amount of capital granted to Companies, and so compels their periodical return to ask for more? It has always been held that the purpose was to ensure a revision of their powers from time to time, so that they may be kept up to the scientific and economic standard of the day. It would appear, however, that this view is a mistaken one. If a Company will but be content to stand by its existing regulations—if, for instance, having a limitation of price to a maximum of 5s. per thousand feet, it abstains from offering to reduce that maximum to 4s. per thousand, or with an illuminating standard of twelve candles it does not ask that it be raised to sixteen—its consumers have no right to be heard. If, however, with a desire to act justly by its constituents, such a Company volunteers these improvements, the barrier is removed, and opposition may be offered all along the line. Such a condition of things appears to us only possible until it is examined into. We are sincerely glad that the British Company, after having fought their way to the final stage, have not lost their Bill in the unusual, and, by them, undeserved way proposed. At the same time, the honourable member for Stoke will have done good service to the public, and we believe also to Companies applying to Parliament, if his action should have the effect of drawing the attention of the authorities of the House of Commons to the existing anomaly, and so secure its speedy alteration.

The Corporation of Arbroath have not given entire satisfaction by the manner in which they have disposed of the last year's profits on their gas undertaking, and fixed the selling price of their gas for the current year. They are under no statutory obligation as to the apportionment of the profits, and, as there was a substantial surplus last year, it was hoped that some relief would have been accorded to the consumers, by the Gas Committee making a proper use of

the opportunity for reducing the price of gas to something nearer the average of certain neighbouring towns. But the temptation to figure as benefactors to the ratepayers was too great to be resisted, and consequently, though not without protest in the council chamber and in the local press, it was finally determined to pass over half of the disposable profit in hand to the Town Council, to be devoted in aid of public improvements. As far as arguments go, the advantage was all in favour of the opponents of this proceeding, but the result was apparently a foregone conclusion. Whether the ratepayers will appreciate the boon in such a degree as to compensate the majority of the Council for the discontent which their action is certain to arouse in the gas consumers is an open question. The satisfaction of the former section of the public constitutes an element of a purely negative character. If they do not grumble quite so much as usual after a measure of partial relief, it is as much as can be expected; but the contentment of gas consumers invariably tends to increase the business which they maintain, and should therefore be carefully furthered on all possible occasions. The truth of this doctrine has yet to be recognized by the majority of the Town Council of Arbroath; but it is bound to be accepted in due time, with such powerful local arguments in its favour as have been recently brought forward.

The notified issue of £50,000 of ordinary "A" consolidated stock in The Gaslight and Coke Company, which will be sold by tender on the 26th inst., forms public evidence of another step in the development of this already immense undertaking, and will bring up the total amount of stock and loan capital employed in it to nearly £9,200,000. The authorization of this issue dates from the 14th of February, 1879, and it forms the last portion of the increase of capital then agreed upon. The Company are enabled to pay for the past half year 11 per cent. on their ordinary shares; and if the prices of coal and materials generally remain at their present level, the accounts may be expected to show, in the gross, equally well next year. Exceptional circumstances may, of course, at any time arise to temporarily cloud over the fortunes of the Company; but in spite of promises of a renewal of what meteorologists term, in a different sense, electrical disturbances, it is to be hoped that Stock Exchange "bears" will not have another chance of operating to the disadvantage of gas property generally, and that of the Metropolitan Gas Companies in particular. For the rest, the present is most decidedly a flourishing time for the gas interest, which may be said to stand to-day in a firmer position than ever it did, and this will probably be manifested in a tangible form by the prices which The Gaslight and Coke Company will receive for their new stock.

The communication by "Isca," on the subject of Dr. Schilling's gas generator furnaces, which we published in part last week and finish in the present issue, is one of the most instructive descriptions of the construction and working of one of the best varieties of this class of retort-furnaces which has yet been laid before the public. Dr. Schilling's work is always thorough, and the form in which his statements are presented to English readers by our contributor should render them easy of comprehension by those to whom these furnaces are a novelty. In a special communication, addressed to us personally, for the benefit of his professional brethren in England, Dr. Schilling lays particular stress on the advantages to be gained by the use of steam in the generator. For Newcastle coke he advises the introduction of nearly fifty per cent. of steam by weight; and he also draws attention to the high temperature which he is able to impart to the air used in the second combustion in the setting, by utilizing the waste heat of the spent products of combustion. He states that this can be managed without difficulty, and that the entire arrangement, as used by him at Munich, works very simply and almost automatically. He very courteously expresses his willingness to show his furnace in action, and explain it fully to any one who feels sufficiently interested in the system to visit Munich for the purpose of inspecting it.

THE Alliance and Dublin Consumers Gas Company having invited offers for 800 unallotted 7 per cent. shares in the Company, received tenders for more than four times the number, and it is stated that the Directors have placed the whole of the shares offered at an average premium of £1 12s. 6d. per share. In several cases the premium paid was £1 15s.

SALE OF GAS SHARES AT BEDFORD.—On Friday, the 29th ult., Messrs. Usher and Antony offered for sale three £100 original shares in the Bedford Gas Company, two of which realized £170 each, and the third £175. The following stock in the Company was also disposed of:—£150 worth of original stock fetched £262 10s., a second lot realizing £270; £187 10s. of original stock sold for £387 10s.; £120 new stock, £162; £151 ditto, £211 8s. At the same time five original £10 shares in the Baldock Gas Company were sold at par.

Water and Sanitary Notes.

POSSIBLY we may hear something to-day as to the report of the Select Committee on the London Water Supply. The Committee met last Tuesday to consider their report, and then adjourned until to-day. Conjecture is rife as to the shape that it will assume, and the extent to which it will go. As the evidence before the Committee deals only with the provisional agreements, it might be thought the report should be limited in like manner. Even then a document of some length would be likely to appear, as any amount of detail might be indulged in concerning the value of the undertakings. The Committee have extensive materials for this purpose. Lieut.-Col. Bolton has handed in a series of tables, including estimates of the future annual working expenses for each million gallons of water supplied, based upon the results of the past nine years. An allowance is suggested for interest on capital outlay at four per cent. per annum, and for wear and tear of plant at one and an eighth per cent. per annum. These average annual outlays are contrasted with the average water-rents, showing the estimated surplus revenue after making what is considered to be adequate provision for working expenses and interest in the case of the district supplied by each Company, and also over the whole of the area supplied by all the Companies. The results go to prove "that the cost of the work of the future, if estimated for on the excessive expenditure of the past, will give a considerable surplus of income over the outgoings, even if calculated out on the average working expenses and 'rentals of the past nine years.'" Another document connected with the inquiry consists of a paper handed in by Sir Theodore Martin, and bearing the date of Tuesday last. This comprises copies of the several agreements entered into by the late Mr. E. J. Smith in treaty with the Water Companies. The great feature in regard to these agreements is the value set on the undertakings, and of this the public have already heard a good deal, though possibly—as Sir Edmund Beckett has signified—few people really understand the matter.

"Father Jean," in the columns of the *Echo*, continues to utter his deep dissatisfaction with all that appertains to the Water Supply of the Metropolis. The recent inquiry by no means satisfies him. "No case for the ratepayers was ever 'presented with less force or on weaker lines.'" So he declares, and then he adds: "The abuse of Mr. Smith was 'childish. The tribute paid to him by the Companies 'Counsel was complete, and deserved.'" This is good, and we are only surprised that "Father Jean" should say it. But he cannot cease to lament what he considers to have been the absolute neglect of the interests of the public as connected with this inquiry. "Can any ratepayer," he asks, "pretend 'that his interests were represented?'" An outburst of "indignation" is invoked. Sir J. McGarel Hogg is said to have enjoyed "a grand opportunity," and to have "failed miserably." "What is now to be done?" asks "Father Jean." What this doughty champion would do if he had the "grand opportunity," is shown by his suggestion that "the business of a Water Company is akin to that of an 'ordinary trader whose business is compulsorily acquired,'" and that "in no case of a going concern has more than five 'years purchase been paid to a trader for his property or his 'unearned increment of future profits.'" "No evidence was 'presented on this head,'" we are told. It is a pity that "Father Jean" was not sent for, to prove the justice of paying thirty-five pounds down as an equivalent for one hundred pounds stock yielding a dividend of seven per cent. "Father Jean," we may observe, shows a marked affection for the Metropolitan Board, and an intense dislike towards the Corporation of the City. He denounces the conduct of the Government in accepting invitations to civic banquets, "The persistence in the association with the old, corrupt, 'unreformed Corporation is an insult to the rest of the 'Metropolis,'" and Mr. Gladstone and the Ministry are told that they "are expected to realize this state of public 'opinion.'" It occurs to us to ask whether "Father Jean" ever tasted turtle soup at the Mansion House? Has he been unaccountably overlooked?

The latest programme of London Municipal Reform, as laid down by Mr. James Beal and his friends, proposes some rather odd things, including a cessation in the bestowal of titles and dignities upon the Civic Authorities, until the day when the Local Government of the Metropolis is finally settled. In the meantime, also, the Metropolitan Board is to be left to deal with the Water Question as it best can, the present temporary agreements for purchase being annulled. Municipal Reform is thus to come first, and the Water Ques-

tion next. "Father Jean" and Mr. James Beal seem agreed on this point, the former saying, "No question can be settled in the Londoner's interest until the House, the Ministry, and Committees understand that the sole remedy in water or gas, or reduced expenditure, is the creation of a Municipality for London."

The policy of the Dublin Corporation during the present session of Parliament, in reference to the Water Supply of Rathmines and Rathgar, has possibly damaged what might be a fair view of the main question. The authorities of Rathmines and Rathgar have been seeking to obtain an independent water supply at a cost of £150,000. It is not unlikely that the Boundary Commissioners will shortly recommend that these two places shall be included in the city of Dublin, and hence it is argued by the Corporation that the proposal to expend a large sum of money for an independent supply of water is a wasteful and injudicious scheme. As it is not quite certain that the township will be included in the city, it was proposed in the House of Commons last Tuesday that the operation of the Rathmines Water Bill should be suspended for twelve months, so as to await the report of the Boundary Commissioners. The Bill had passed the Lords, and was then awaiting its third reading in the Commons. After a brisk debate the House divided, and the suspensory clause was rejected by a large majority. The Corporation of Dublin need not wonder that Parliament should pass the Rathmines Bill, seeing that in 1874 the Corporation deprived that township of its right to a share in the city supply. So thoroughly had the Corporation severed Rathmines from the Dublin Water Supply, that the Commons Committee refused the Corporation *locus standi* against the present Bill. To get the township cut off from all right to the Vartny water, and then to come forward to prevent them from obtaining a water supply of their own, was not the way to gain the support of Parliament.

A species of conglomerate deputation—comprising representatives of the Fisheries Preservation Association, the Sanitary Institute of Great Britain, the Association for Preserving the Rivers and Lochs of Scotland, the Fishery Boards of the Severn, the Trent, and the Wye, the Rivers Purification Association, and the Manchester Anglers Association—waited on the President of the Local Government Board last Tuesday, introduced by the Duke of Buccleuch. The deputation came to submit for the consideration of Her Majesty's Government, whether the time had not arrived for largely amending the Rivers Pollution Act of 1876, so as to render the statute more effective. Lord Ebury, Lord Denman, Viscount Melville, Lord Elihan, Sir Anthony Brady, and other notabilities, were among the parties thus coming forward. It was urged that the Act in its present form was little else than a dead letter, and the rivers and streams were going from bad to worse. "Some short and summary mode of dealing with the matter" was demanded, and certain amendments in the law were set forth. Mr. Dodson replied that he had "the greatest pleasure" in seeing so large and influential a deputation; but he had the pleasure, a short time ago, of receiving a deputation "at least as large, and also very influential," complaining of the stringency of the Act, and asking for some relief. All the Government could do was to reconcile conflicting interests as far as possible, and when the time came for doing something, or thinking about it, the observations made by the deputation would receive consideration. Having obtained this kind of answer, it only remained for the deputation to thank Mr. Dodson and withdraw, which was done. The subject is not an easy one to deal with, and it is to be feared that little progress is being made in purifying the streams by virtue of the Act of 1876. If the manufacturers cry out, we presume the law is not quite dead; and if the opposite parties also complain, we must conclude that the Act is a moderate one.

Signs are given of a fresh agitation concerning the effect of the Metropolitan main drainage outfalls on the Thames. The Woolwich Local Board recently addressed a letter to the Metropolitan Board, asking for immediate attention to be given to "the present filthy condition of the Thames," which is said to be endangering the health of the inhabitants of Woolwich and its neighbourhood. It is stated that at high water the river is black, emitting a most offensive odour, and that sewage matter can be seen floating on the surface. The cause assigned for this state of things seems to be something other than the regular and proper action of the outfalls. It is alleged that the sluices are opened before the flow of the tide has ceased, instead of after the commencement of the ebb. Hence a portion of the sewage is carried upward before it begins its downward course. This premature opening of the

sluices is said to be contrary to the orders given to the parties in charge. We are disposed to fear that the late heavy rains have so overcharged the sewers that it has been found necessary to open the sluices before the proper time, and hence the nuisance has arisen as described. If any other explanation can be offered, we shall be glad to hear of it. We hope that in some way the evil can be shown to be temporary only in its character.

The disposal of the sewage of Derby was, a short time since, the subject of an able and extensive report from Mr. Clement Duncombe, C.E., who has recommended the Town Council to alter the present system prevailing in the locality, so as to turn the whole of the excreta into the sewers, and make Derby a completely water-closeted town. He proposes the construction of intercepting sewers, and the adoption of an irrigation farm of nine hundred acres. If the land cannot be obtained on reasonable terms, he suggests the employment of intermittent downward filtration, for which one-third of the former area would be sufficient. Or, he says, a scheme of combined precipitation and filtration might be carried out. Other plans are also discussed, and the Town Council will now have to consider what they will do.

On the invitation of the Native Guano Company, a large and distinguished party visited the sewage works at Aylesbury a few days ago, where they witnessed the application of the A. B. C. process. The town contains about eight thousand inhabitants, and the sewage amounts to three hundred thousand gallons daily, which is made to yield nine or ten tons of "native guano" per week, selling at £3 10s. per ton. Five members of Parliament were present, and several scientific persons, besides numerous representatives of local authorities, both at home and abroad. Mr. Clare Sewell Read expressed his opinion that the treatment of sewage was a science which had made great advance, and while he believed irrigation was the best mode of getting rid of sewage on some soils, he considered that the A. B. C. process would be of considerable advantage to a large number of towns, particularly in the North of England.

The proposal to transfer the Royal Mint from Tower Hill to the Victoria Embankment is taking a very practical shape, and we may possibly hear some revival of the objections to that project, on the ground that the vapours from the chimneys of the Mint will be deleterious and annoying. But according to a report drawn up by Mr. Keates, the Consulting Chemist of the Metropolitan Board of Works, some few years ago, no mischief of this kind is to be apprehended. The proposed site belongs to the Corporation, and consists of about three acres, valued at a quarter of a million sterling.

It is announced that, at the meeting of the Board of Directors of the South Staffordshire Water-Works Company, last Thursday, it was resolved, subject to the examination of the accounts by the Auditors, to recommend to the Proprietors the declaration of a dividend for the past half year, on the ordinary stock, at the rate of 3½ per cent. per annum, less income-tax. At the corresponding period last year the dividend declared was 3 per cent.

KIRKCALDY GASLIGHT COMPANY.—The fiftieth annual meeting of this Company was held on Wednesday last—Mr. Nelson, Chairman of the Board, presiding. From the report of the Directors it appeared that, although circumstances as regards trade in general were adverse, the Company had continued to prosper. The Directors had made considerable additions to their mains, which now extend to upwards of 25 miles. The demand for gas had increased, this increase last year amounting to about 14 million cubic feet. The working during the past twelve months had produced a profit to the Company which enabled them not only to pay the usual dividend, but to make a still further reduction in the price of gas, which was reduced last year from 4s. to 3s. 9d., and is now to be reduced to 3s. 6½d. per 1000 cubic feet. On the motion of Mr. Gibb, seconded by Bailie Hendry, the report was unanimously adopted; and the following gentlemen were elected Directors in the room of those retiring:—Messrs. Nelson, Stark, Tod, Ness, Whyte, and Brown. The services of the Clerk and Treasurer (Mr. Spears), and of the Company's Engineer (Mr. A. MacPherson), having been duly acknowledged, a vote of thanks to the Chairman brought the meeting to a close.

NEW COMPANIES REGISTERED.—The following new Companies have recently been registered:—The Blyth and Cowpen Gaslight Company, Limited, was incorporated on the 16th ult. with a capital of £10,000, in 45 shares, to acquire the undertaking and property of the Blyth and Cowpen Gaslight Company, in the county of Northumberland.—The Henley-on-Thames Water Company, Limited, was registered on the 15th ult. with a capital of £10,000, in 410 shares, for the purpose of supplying Henley-on-Thames and the district with pure soft water. Among the first subscribers we notice the name of Mr. Jabez Church, C.E.—The Westernham Water-Works Company, Limited, was registered on the 19th ult., with a capital of £2500, in 45 shares, for providing the town of Westernham, in Kent, with a supply of water.—The Rimstall Gaslight, Coal, and Coke Company, Limited, was registered on the 22nd ult., with a capital of £3000, in 45 shares, to carry on the ordinary business of a gas, coal, and coke company.—The House Sanitary Appliances and Inspection Company was also registered on the 22nd ult., with a capital of £45,000, in 45 shares, to carry on the business of sanitary engineers and inspectors, also to advise and execute sanitary works in connection with dwelling-houses, hospitals, asylums, public institutions, schools, factories, workshops, offices, lands, buildings, and property. Among the first subscribers are Dr. Alfred Carpenter, of Croydon; Mr. J. Bailey Denton, C.E.; and Mr. Ernest Hart.

Finally, the work done in the regenerator remains to be calculated. Of the total heat developed by the combustion of the heating gases in the retort-setting—i.e., 1610 calories—the smoke gases, leaving at 1250°C , carry off 760 calories in every cubic metre. In heating the air to 1090°C , 298 calories are regained, and in the production of steam one cubic metre of these gases also gives up $114 \times 345 = 39$ calories as useful work; hence $298 + 39 = 337$ calories of work are extracted from the waste heat in the regenerator, leaving the amount lost by the chimney 379 calories only. If the air, instead of being heated in the regenerator, were admitted into the setting at 0°C , the generator gases would yield $963 + 349 = 1312$ calories, and the intensity of combustion would be $1312 \div .573 = 2290^{\circ}\text{C}$. instead of 2809°C . The process of regeneration, therefore, increases the temperature 519°C , or nearly 23 per cent. Formerly the regeneration only produced an increase of 14.6 per cent.

Let me recapitulate in tabular form the principal facts which have been mentioned:—

Duty derived from One Cubic Metre of Generator Gases.

	Calories.
Developed in the generator	657
Add for hot coke	32
	689
Deduct for decomposition of steam	303
Lost by radiation and conduction	37
	340
	349
Developed by complete combustion of generator gases in retort-setting	963
Add for air supplied at 1090°C	298
Total disposable heat	1610
Disposed of as follows:—	
Heat used and lost in retort-setting	894
Recovered in regenerator by heating air	298
Recovered in regenerator by production of steam	39
Lost by chimney	379
Total	1610

Referring the whole to the unit of 1 kilo. of carbon, the difference between the new and old generators is as follows:—

	At present. Calories.	Formerly. Calories.
Sensible heat passed from generator into retort-setting	2251	1855
Produced by combustion of gases	6211	5595
Total heat in setting	8462	7250
Which is thus disposed of—		
Used in carbonizing, including loss	5766	4438
Used in production of steam	252	
Lost by chimney	2444	2812
Total as above	8462	7250

The quantity of heat used in the setting per 24 hours is thus—

At present	$953 \times 5766 = 5,494,998$ calories.
Formerly	$1296 \times 4438 = 5,751,648$ "

Dividing this quantity by the weight of coal carbonized, we obtain the quantity of heat utilized in carbonizing 1 kilo. of coal thus: $5,494,998 \div 6887 = 798$ calories, as compared with 784 calories formerly used. So that, although the gross fuel consumption is less, the coal carbonized really receives more heat than before. Converted into English units, we see, therefore, that Dr. Schilling finds it necessary to provide 1439.3 units of heat for carbonizing 1 lb. of coal, including waste, but exclusive of the proportion necessarily lost by the chimney.

In a note to his communication, Dr. Schilling states that since the period for which the above data were compiled the generators have been working with even greater economy of fuel. Thus, from Feb. 20 to Feb. 27, the consumption of coke per day was 939 kilos., and from Feb. 29 to March 5 the consumption decreased to 909 kilos., per day. Taking the coal carbonized at the same weight as before, this latter consumption is equivalent to carbonizing 7.6 tons of coal with 1 ton of coke—a result which Dr. Schilling may well consider worth recording.

LIGHTING HUELVA WITH GAS.—Some time ago a Company was formed in Glasgow for the purpose of working a concession obtained from the Municipality of Huelva of the exclusive right to light the town with gas, and tenders for the execution of the works were advertised for. The successful Contractors—Messrs. Laidlaw, Sons, and Cairne—have just completed the works, the official inauguration of which took place on the evening of the 15th ult.

TEIGNMOUTH LOCAL BOARD GAS SUPPLY.—On Tuesday, the 27th ult., an inquiry was held at Teignmouth, by Mr. R. Morgan, C.E., one of the Local Government Board Inspectors, with respect to an application from the Local Board for powers to borrow £2500 for extending the gas-works. During the last ten years the gas supply of Teignmouth has doubled, and the proposed extension is necessary in order to keep the town properly supplied. It was stated that the Board had worked their plant up to its fullest capacity, and now wanted the amount asked for to enable them to meet the town's requirements. There was no opposition to the application.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

MR. METHVEN'S TEST FOR ILLUMINATING POWER.

SIR,—In reply to Mr. Hartley's letter in your issue of the 20th ult., I am, under the impression, upon the reading of Mr. Methven's paper in 1878, that the principle of the test is an aperture (or slice) which admits a pencil of light to pass and fall on the centre of the photometer disc, the pencil of light being equal to the light which passes from two standard candles, each consuming 120 grains of sperm per hour. I presume Mr. Hartley does not dispute the ability to find such an aperture, but he disputes the flame from which that pencil of light passes.

The slice of flame, or pencil of light, which passed through the aperture in my experiments, was equal to the light which passes from two candles, each consuming 120 grains of sperm per hour. With a 3-inch flame consuming at the rate of 5 cubic feet per hour, through a 15-hole Argand with 2-inch by 2-inch chimney, I found the average of ten observations equal to 8.25 of the double candles; and the pencil of light which passed from the 3-inch flame consuming 5 cubic feet per hour, through a 15-hole Argand with a 7-inch by 2-inch chimney, against the opposing 3-inch flame of the same gas, consuming 5 cubic feet per hour through a 15-hole Argand with a 7-inch by 2-inch chimney. I also found the average of ten observations equal to 8.28 pencils of light. Therefore the gas against candles equalled 16.50 candles, and the gas-light against a pencil of light from the same gas equalled 16.56 candles. The pencil of light and the candles are thus nearly equal.

The candle is a common standard to the British gas consumer; but I submit, Mr. Hartley is in error by opposing the light of it to the slice or pencil of light developed in a gas burner.

In reply to Mr. Hartley's question—"Are my experiments on the same gas but different heights of flame?"—I may say that they are; and they confirm facts recorded by Mr. Hartley in the JOURNAL of Aug. 20, 1878, page 272, where he said: "If the zone of maximum luminosity be higher in one flame than in another, it follows, as it appears to me, that there must be a difference in the total values, even as there are differences in the parts. Hence I dispute that it can be literally true that slices (so to speak) cut out of the flames of different gases at a fixed distance between apex and base, can be equal in lighting power." In a remarkable fact that gentlemen proposing new standards as substitutes for candles because of their irregularities, do not challenge the abuse of the candles in the authorized box photometer. The temperature; the unequal draught towards the burner; and the shifting of the candles instead of the disc. These are points on behalf of the candle which demand consideration; and, after these abuses are rectified, the proper use of the candle may be gracefully considered.

W. LYON.

July 31, 1880.

MR. LEWIS T. WRIGHT ON MR. NIVEN'S PAPER ON CORRECTIONS FOR TEMPERATURE AND PRESSURE.

SIR,—I observe in the JOURNAL of the 13th inst. a letter from Mr. Lewis T. Wright relating to my paper on barometric and thermometric calculations. Its object was undoubtedly to give me instruction and, of course, I should feel grateful. But between assertion and proof there is chasm that can only be bridged by fact. Whether that fact has been produced I shall now consider, and in order that justice may be done, the paragraphs criticized shall be quoted.

Well, here is the argument brought forward with the view of proving my ignorance: The formulae for dry and damp gases are based upon the conception of absolute temperature; but Mr. Niven has no idea of absolute temperature; therefore he has no idea of the formulae. This argument would be valid if the premises were granted, but I do not grant them. Of course Mr. Wright might say, as an evasion, that he never addressed such an argument. Probably not; but a gasman pays as much attention to what is implied as to what is expressed, and if this argument is not running through his letter, then his letter should never have been written. I pass by his description of an air thermometer, only remarking that the disadvantage of such an instrument is that we cannot judge of its index of temperature unless we take note of the barometer at the same time and place.

Mr. Wright says the law of pressure is: "The volume of a portion of gas varies inversely as the pressure, temperature being constant." The law for temperature is: "The volume of a gas under constant pressure expands when raised from the freezing to the boiling temperature, by the same fraction of itself, whatever be the nature of the gas." Now, a law should always be stated clearly and distinctly, if for instruction. To speak of "a portion of gas" conveys the idea of part, in the sense of partial, but the proposition is meant to be universal in its application to gas; wherefore the law of Boyle or Mariotte should be expressed thus: The volume occupied by a gas varies inversely as the pressure, temperature being constant. The second law is indefinite, for it is said that the volume expands by the same fraction of itself, and yet there is no mention of the condition of this fractional expansion. The law of Charles or of Gay-Lussac should be expressed thus: The volume of a gas when raised from 0°C . to 100°C . increases for each degree centigrade by the same fraction of its volume at 0°C ., whatever be the nature of the gas, pressure being constant.

Mr. Wright proceeds to absolute temperature as follows:—"Taking freezing point at 32° (1), and boiling point at 212° (1.366), find the temperature expressed at the bottom of the tube by continuing the Fahrenheit scale to that point. A simple calculation will show that it would be -460° Fahr. Let us shift the zero to the bottom of the tube and scale upwards on the Fahrenheit system, and the freezing point will consequently be on the new scale at 492." Temperature expressed in this scale is termed by scientific men absolute temperature." Such is the serious idea of absolute temperature! But to speak of the temperature expressed "at the bottom of the tube," and shifting "the zero to the bottom of the tube," conveys no intelligible idea to persons who do not know anything of the subject; and those who do must supply from their knowledge what is required to give them a clear and distinct

idea. I will therefore give the explanation of absolute temperature thus: Suppose the horizontal section of the tube of the air thermometer be 1 square inch, then if at a temperature of 0° C. the air in the tube stand at 30 inches, at 273° C. it will stand at 60 inches, or double; for 1.273d is increased for every degree centigrade from zero. Again, suppose the temperature, instead of increasing above zero, to decrease below it until it became - 273° C., then if the air in the tube decreased by the same fraction of its volume at 0° C. for each degree centigrade as the temperature was lowered, the air in the tube would be reduced to zero, and - 273° C. at the bottom of the tube would be called the absolute zero point of the air thermometer; and temperatures reckoned from this point are called absolute temperatures. But - 273° C. is equal to - 460° F., and 492° below 32° F. is 460° below zero F., or - 460° F. I may state that Sir W. Thomson and others consider that a body is absolutely deprived of all heat at about - 270° C., which is nearly the absolute zero point of the air thermometer. I think that the conception of absolute temperature is now understood, so that he who runs may read. Mr. Wright thinks I am puzzled as to how the number 460 in the formula is obtained. If he thinks that, because - 460° Fahr. is the absolute zero point, the factor 460 is based on the conception of absolute temperature, then the puzzle is with himself; but I shall enlighten him before the close of this letter. At this stage I have contributed material to answer the minor premises of his argument to prove my ignorance—viz., that I had no idea of absolute temperature. I respectfully submit that I have disproved that premise, and by my mode of denial I have implied the affirmation that Mr. Wright himself had no clear idea of absolute temperature.

To proceed with my analytical criticism. The experimental laws relating to volume, temperature, and pressure are all important for us to know. The law of Boyle assumes temperature to be constant; the law of Gay-Lussac assumes pressure to be constant; and another law assumes the volume to be constant. The last law may be expressed thus: The pressure of a gas increases uniformly with the temperature, volume being constant. The conception of absolute temperature simplifies these three laws into an equation. Mr. Wright has attempted an equation, and while he has stated correctly the data, still the symbols completely puzzle him. He says: "Let V, P, T, be the observed volume, pressure, and temperature on the absolute scale, and V° the volume at standard pressure P°, and standard temperature T° on absolute scale" (I now leave him for a moment), then it will follow that—

$$\frac{V P T^{\circ}}{P^{\circ} T} = \frac{V^{\circ} P^{\circ} T}{P T^{\circ}}$$

$$\therefore V = \frac{V^{\circ} P^{\circ} T}{P T^{\circ}}$$

But T and T° being standard temperature and pressure, the improper fraction $\frac{T^{\circ}}{P^{\circ}}$ is constant. If $\frac{1}{492}$ were the coefficient of expansion, the ratio $\frac{T^{\circ}}{P^{\circ}}$ would be—

$$\frac{480 + 60}{30} - \frac{32}{30} = \frac{508}{30} = 16.933.$$

If $\frac{1}{492}$ were the coefficient, the ratio $\frac{T^{\circ}}{P^{\circ}}$ would be—

$$\frac{492 + 60}{30} - \frac{32}{30} = \frac{520}{30} = 17.333.$$

Wherefore for dry gases the formula is—

$$V^{\circ} = \frac{17.333 (V P)}{T}$$

Mr. Wright says the formula for dry gases is $\frac{V P 17.333}{T}$. Of course

we know what he means; but such a negligence in manipulating equations does not tend to precision. Another instance of his carelessness (of course had he been in my position he would have said not carelessness, but ignorance) is the final form of his formula—

$$V^{\circ} = \frac{V P}{P^{\circ} T}$$

Mr. Wright does not here show how the last term is connected, because we know we mentally contribute the "into." He should have had it either as in my form of it, or put a \times between the terms. But I am beginning to doubt if, after all, carelessness explains the following expressions:—

$$V^{\circ} = \frac{V P 520}{T 30 - 5178} = \frac{V P T 17.64}{T}$$

This equation as it stands is not true. How Mr. Wright could have penned the middle expression is very strange. If he sees nothing wrong in the equation, I shall be happy to enlighten him.

Mr. Wright says that my formula is useless, because, "firstly, it does not apply to change of pressure; and, secondly, it is wrong." That Mr. Wright should consider my formula for temperature to be useless because it does not apply to pressure, is an argument that would invalidate the law of Gay-Lussac on temperature. The coefficient of the expansion of gases could never have been discovered had this reason been applicable. The fact is Mr. Wright is getting deeper into the mud of confusion; but he attempts to prove my formula is wrong thus:—The reasoning from Fowne is that the rate of expansion is 460 measures at 0° C., becomes 461 at 1°, 462 at 2°, &c., whereas Mr. Niven takes "the rate of expansion at 1.492nd of the volume at any temperature whatever." Now, Gay-Lussac held that the gas increased according to temperature in a certain fixed proportion of its initial volume at 0° C., while Dalton held that the increase of volume according to temperature was by a constant fraction of its volume at that temperature. But my formula being based upon the initial rise of volume at 60° Fahr., the standard, I am between the truth of Gay-Lussac and Dalton. To use a logical phrase, there is here no excluded middle. I am, therefore, not surprised that Mr. Wright admits that, "owing to the rather hazy form of the problem," he "could not at first detect where Mr. Niven had been led into an error." Perhaps I may be excused for saying that the haziness is not in the problem but in the eye that views it. My formula for the correction of temperature, accurate to a thousandth part

of unity, is the basis of a method of calculation that enables any one to solve six problems during the time in which, by the ordinary method, he could do one. Mr. Wright is in confusion between the figures, 1.460th and 1.492nd. I shall put them in a plain view. The volume of gas absolutely expands between 32° Fahr. and 212° Fahr. at the rate of 1.492nd for each degree from 32° Fahr., the formula for this being—

$$V = V^{\circ} \frac{(460 + t)}{492}$$

But when gas is reduced to the standard temperature, the factor 460, as explained in the foregoing reasoning from Fowne, is employed. Now, Mr. Wright thinks that the factor 460 is based upon absolute temperature. I reply that while 460 may be taken as implied in absolute temperature, yet even the conception of absolute temperature is based upon the law of expansion as finally fixed by Regnault; and the question arises—Can 460 be deduced from the formula that expresses the law of Regnault or Gay-Lussac? I answer—Yes. Thus, as above—

$$V = V^{\circ} \frac{(460 + t)}{492}$$

But if t increases and becomes t' , then the V becomes V' ; wherefore—

$$V' = V^{\circ} \frac{(460 + t')}{492}$$

But by an easy process of equation we can eliminate from these two expressions V° and 492, and then the equation becomes—

$$V' = V \frac{(460 + t')}{460 + t} \quad Q. E. D.$$

And thus the quotation from Fowne is merely a translation into simple language of this formula.

I now, in conclusion, repeat the celebrated argument intended to prove my ignorance: The formula for dry and damp gases are based upon the conception of absolute temperature; but Mr. Niven has no idea of absolute temperature, therefore he has no idea of the formula. Logicians would say this argument was in Camesrates, and if it were not plain it could be reduced to Celarent. The form, however, is valid. Let me now say as to its matter—(1) That the major proposition is a pure assumption, and false; (2) that the minor is also false, and would be probably true were Mr. Wright's name substituted for that of Mr. Niven; and that therefore (3) the argument is invalid. For Mr. L. T. Wright to tell me that his father and Mr. Vernon Harcourt understood the subject is altogether a gratuitous statement, and I beg to inform him that he need not be displeased with me for pointing out the 480 as being now displaced by 492, for the 480 in Mr. Alexander Wright's day could only be provisionally accepted as correct. I, however, thank Mr. Wright for the occasion he has given me to explain a little more fully some facts and principles which, although cognate to the subject of my paper, yet were not necessary to my purpose in writing it.

Gas Works, Dunoon, July 21, 1880.

D. COATS NIVEN.

If the resolutions—of which the following are three—reported to have been passed at the meeting last week of that indefinite body, the Metropolitan Municipal Association, are correctly given, a programme has been laid out that in realization will tax to the utmost, and probably overtax, the energies of so very uninfluential a set of men as those ever heard of in connection with the society. The resolutions to which we refer are:—"That it is desirable to propose such amendments in the Municipal Reform Act, 1885, as will centre in each municipality all administrative work, school board, poor law, and other results of modern legislation, and the acquisition by municipalities of all water and gas supply, so that the municipality becomes the one authority absorbing all others for purposes common to the area of municipal action." "That outside municipal areas it is desirable to confer the like authority on county boards, with full authority to deal by joint action with other county boards for control of waterbeds and water and drainage administration." "That the proper solution of the London Water Question is by reporting against the agreements for purchase at present in temporary force, leaving the Metropolitan Board to deal with the question until Her Majesty's Government are prepared to take into consideration the whole question of reform of London local governments."

EXTENSIONS AT THE CHELMSFORD GAS WORKS.—To meet the increased demand for gas all over their district, which has lately been greatly enlarged, the Chelmsford Gas Company are carrying on considerable alterations and extensions at their works at Springfield, consisting of a new gasholder-tank, gasholder and guide frame, offices, stores, and laboratory; at a total cost of about £4000. The tank and holder have been designed by the Company's Engineer, Mr. Arthur Mead, Assoc. M.T.C.E. The new offices, stores, laboratory, and other buildings will occupy a site near the Wharf Road than the old ones, and the latter are to be pulled down to make room for an extension of the manufacturing plant. The gasholder-tank is to be 74 feet in diameter and 24 feet deep, and is to cost £1849. It will receive a telescopic holder with an inner lift, 70 feet in diameter. The guide-frame and the holder will be so constructed that an outer lift, 72 feet in diameter, can be raised and lowered as a separate and steadily small one. The capacity of the inner lift will be 35,000 cubic feet, and it can be so enlarged as to hold an additional 90,000 feet. Messrs. Samuel Outler and Sons, of Millwall, are making the holder and guide-frame, at a cost of £2137.

NORWICH WATER WORKS COMPANY.—The half-yearly meeting of this Company's shareholders on Wednesday, the 28th ult.—Mr. R. N. Bacon, the Chairman, presiding, was attended by 120 shareholders, and was presided over by the Secretary (Mr. R. Cooper) read the balance-sheet, to March 25, 1880, also the report of the Directors, which stated that the revenue account showed that after payment of all working expenses, debenture interest, and dividends on preference shares, there remained a sum sufficient to pay a dividend on the ordinary shares at the rate of 6 per cent. per annum, deducting income-tax, leaving a balance of £1211 15s. 11d. to the credit of the next half-year's account. The Directors had, therefore, declared a dividend at this rate. The Contractor for the new pumping engines at Helgham was the report stated, proceeding with their erection, and the directors and engineers had found them in complete repair and performing their proper functions, and, in particular, the filter-beds afforded water of excellent quality. The new constructions had been carried out by the Manager (Mr. Ayris) in a very admirable manner, and not a fault could be found either in the brickwork, foundations, or in any other respect.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.

SESSION 1880.

PROGRESS MADE TO SATURDAY, JULY 31.

Title of Bill.	Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Ackworth, Featherstone, Purston, and Sharlston Gas Bill	Lords Commons. Bill Feb. 9	June 25 Feb. 10	July 5 March 8	July 15 June 15	July 20 June 24	..
Birkenhead Borough Bill	Lords Commons. Bill with- drawn.	June 25 Feb. 10	July 5 March 8	July 15 June 15	July 20 June 24	..
British Gaslight Company, Limited (Staffordshire Potteries), Bill	Lords Commons. Lords Bill.	Feb. 10 June 24	Feb. 23 July 5	June 17 July 20	June 22 July 23	..
Burton-upon-Trent Corporation Bill	Lords Commons. Bill with- drawn.	Feb. 9 June 24	Feb. 10 July 5	Feb. 16 July 20	March 11 July 27	..
Cardiff Water Bill	Lords Commons. Lords Bill.	Feb. 10 March 11	Feb. 20 May 31	March 8 June 11	March 11 June 15	June 29
Chester Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 March 12	March 19 Feb. 24	June 4 March 2	June 8 March 11	June 29
Cork Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Cork Improvement Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Dagenham and District Farmers (Optional) Sewage Utili- zation Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Dartford Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Dearne Valley Water Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Denton and Haughton Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Donecaster Corporation Water Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	June 29
Eastbourne Gas Bill	Lords Commons. Lords Bill.	May 28 June 8	June 15 June 21	March 16 June 25	May 25 June 29	June 29
Edinburgh and District Water Bill	Lords Commons. Bill with- drawn.	Feb. 9 June 24	Feb. 10 July 5	Feb. 16 July 20	March 11 July 27	July 9
Exmouth and District Water Bill	Lords Commons. Lords Bill.	Feb. 10 March 5	Feb. 16 March 15	Feb. 26 June 1	March 2 June 10	June 14
Gaslight and Coke Commercial Gas, and South Metropolitan Gaslight and Coke Companies Bill	Lords Commons. Bill with- drawn.	Feb. 9 June 25	Feb. 23 July 8	June 11 July 19	June 24 July 19	..
Great Yarmouth Water Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	Feb. 17 July 9	July 9 July 19	July 22 July 23	..
Hinckley Local Board Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Huddersfield Tramways and Improvement Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Hull Lighting Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Hyde Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
King's Lynn Corporation Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Lancashire County Justices (Water, &c.) Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Lancaster Corporation Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Lincoln Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Liverpool Corporation Water Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Liverpool United Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
London Gaslight Company Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Maidstone Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Malton Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Oldham Improvement Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Phoenix Gaslight and Coke Company Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Portmadoc Water Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Prescot Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Preston Improvement Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Rathmines and Rathgar Township (Vatry Water Supply) Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Rathmines and Rathgar Township Water Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Reading Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Rochester Corporation Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Sea Water Supply to London Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Sligo Borough Water Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
South Metropolitan Gas Company Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Southwark and Vauxhall Water Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Stafford Borough Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Wakefield Corporation Water Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Wandsworth and Putney Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Wigan Improvement Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Wrexham Water Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..
Yeadon and Guiseley Gas Bill	Lords Commons. Bill with- drawn.	Feb. 9 Feb. 10	March 1 July 5	June 18 July 19	June 22 July 23	..

township of Rathmines out of the benefit of the Vartay water supply scheme. Under these circumstances, he trusted the House would not deem it prudent to adjourn a Bill on this subject, and that a Committee debate should be raised in the House, and adjourned. The effect of an adjournment would be what the honourable member for Dublin seemed to wish—namely, to postpone the Bill *sine die*.

Sir W. Lawson said Mr. Granville Somerset told the Committee, when the Bill was before them, that, appearing for the Corporation of Dublin, he did not practically oppose the preamble, but only the clauses.

After some further discussion, The motion to adjourn the debate was withdrawn, and on the question "That the proposed clause be read a second time" being put, the House divided, and the numbers were—

For the clause	51
Against	251

Majority against	200
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The clause was therefore rejected, and the Bill ordered to be read the third time.

WEDNESDAY, JULY 28.

BRITISH GASLIGHT COMPANY, LIMITED (STAFFORDSHIRE POTTERIES), BILL.

On the order for the third reading of this Bill, Mr. WOODALL said: I rise to move in accordance with the notice I have given, the rejection of this Bill; and I hope to satisfy the House, in the few words I shall speak, that, in asking them to take this exceptional course, I am asking them to take a course which is but reasonable. The members of the House are aware that the British Gaslight Company Limited. They supply, in addition to two towns of the six which I have the honour to represent, the city of Norwich, and a portion of the town of Hull, and these separate places they supply under separate Acts of Parliament, and in addition they supply several other towns, for which they have no statutory powers, and until this year there has not been any parliamentary restriction upon them in respect to those towns. I may state also that they supply some other districts under certain arrangements; but while they have these numerous districts all over the country, the whole management is in a London Board, with their offices in the City. Now, the Bill which the House is now considering, and which was introduced into the House, and was opposed before a Committee of that House, by the Corporation of the borough of Hanley and the Tunstall Local Board, in which two places there is a strong and unanimous feeling against the Company, and the greatest dissatisfaction with the way in which its business is transacted. The Committee of the House of Lords passed the Bill, and in the certain modifications in the preamble of the Bill, and in the certain modifications in the clauses; but the petitioners, desiring to reserve their case, refrained from discussing the clauses in the other House. Honourable members may imagine the mortification of my constituents on finding that, on a technical construction of the rules of this House, the petitioners had no *locus standi* before the Committee, and that they were consequently excluded from the promoters of it merely asked for powers to employ a further amount of capital. I do not for a moment call in question the decision of the Court of Referees. I am sure that in coming to it they did so upon what they deemed to be a correct interpretation of the precedents that had been established; but I think that in a case of extreme hardship, injuriously affecting the interests of the population of the district, which probably for the next 20 or 30 years will be handed over, as to what may be regarded as a necessary of life, to the tender mercies of the Company who have the supply of gas in their own hands. I will not go into the details of the case; but I observe that of late years the Company, when a company has come to Parliament to raise further capital, to impose restrictions on the company, compelling them to sell their new capital by public auction or tender; but it is pleaded that, in consequence of the peculiar position of this Company, they are unable to adopt the auction mode, and that they have accepted a restriction of 5 per cent., which is to be the maximum dividend to be paid on the new capital. Now I do not conceal for a single moment that this is an important protection to the public interest, but from the fact that the Company have separate Acts of Parliament for their different districts, and that in a central position they are enabled, by an ingenious provision, to defeat the provisions of the general Act of Parliament, which is largely under their Act for the Staffordshire Potteries they were forbidden to pay more than a maximum dividend of 10 per cent. on the original shares, and they were limited to 7½ per cent. on the additional share capital raised; but it is hardly to be imagined that the members of the House, who have purchased the gas-works, and who have paid the capital employed in their undertaking, and at this moment I hold in my hand a circular sent out by the Company, in which they propose to issue new £20 shares to meet this further outlay, the interest on which is restricted to 5 per cent., and yet they offer to issue these £20 shares at £34 each. Nothing could be more clear than the fact that, by some clever manipulation, they in some way or other contrive to pay the whole of their Shareholders a dividend in excess of that sanctioned by Parliament. They plead that in the Staffordshire district they have not been able to earn even the maximum dividend allowed by law. Now, if this could be able to show, if we were permitted to go before a Select Committee, that this is largely to be attributed to the manipulation I have spoken of, or, as the inhabitants complain, of gross mismanagement of the Company's business. In proof of this, I may state that within the borough I have the honour to represent, three small boroughs—Burslem, Stoke, and Longton—have the same position as the Company, and they have not only paid a premium on the original shares, but they have been able not only to pay the interest on the large capital necessary to be raised, but they have also been able to write off annually a certain portion of the capital itself, to set aside a sum for Parliamentary purposes, and out of the profits they have appropriated an ample sum, and have saved the public an amount equivalent to a reduction of 7d. per 1000 feet in the price of gas. This is a case of peculiar hardship on the opponents of the Bill under discussion. There is nothing in common between the proprietors of these gas-works and the consumers of gas, and it is not surprising that the House of Commons naturally desire to be placed in as good a position as they can. Their rights are willing to pay—they have offered to guarantee the British Company their maximum dividend; they have offered 20 years purchase; and they have proposed to buy on the terms which an arbitrator might name. My constituents having had no opportunity of submitting their views on the consideration of a Select Committee, I hope the House will refrain from passing the Bill, which would make my constituents helpless in this matter for a long term of years. Their only opportunity of bringing their grievance before Parliament is when, as on this occasion, the Company come to Parliament, and they are enabled to express their views. I am authorized to state that neither the public interest nor the interest of the Company will suffer by the Bill being delayed for another year. The evidence goes to show that there has been no great increase of business within the last few years, and therefore I move—"That the Bill be read the third time and then lay three months." I thank the House for their indulgence, and for thus enabling me, in the interest of my constituents

and of a large population, to state the reasons why they should not confirm what would undoubtedly be a gross wrong.

Mr. FRANKLIN: I was a member of the Court of Referees to which the Staffordshire members have referred in this case, and at that occasion had the honour of acting as Chairman. I beg, therefore, to acknowledge the courtesy of the honourable gentleman in giving me notice of his intention to move the rejection of the Bill—not that I understand that he in any way impeaches the decision of the Court, but that he simply wishes to call the attention of the House to the case, in which that decision operated unfavourably to the population of the district to which the Bill refers. The House is aware of the constitution of the Court of Referees. It is composed partly of members of the House and partly of the Official Referees. The Court of Referees is to consider the merits of the Bill before them, and simply decide, when a petition is presented against a Private Bill, whether, according to the practice of the Court, the petitioners have a right to be heard, and to go before the Committee which has to decide on the merits. In coming to this decision, they invariably go on the practice of the Court—the practice laid down partly by Standing Orders, and partly by previous decisions, which are carefully reported and published by barristers practising at the parliamentary bar; and though the Court has never conceived itself bound to invariably follow these decisions if they have been arrived at by some mistake or some peculiarity in a particular case, I think it will not be found that on this occasion there has been any hardship whatever, and that the Court has acted in a perfectly correct and on justice. Where a water company or a gas company simply come forward with a Bill to improve their existing works without raising additional capital, without increasing the rates charged to the consumers, without increasing the quantity or deteriorating the quality of the article—where, in fact, the Bill is to improve the works, and to improve the service, and under powers which they already possess—in that case we consider the consumers have no right at all to resist the progress of the Bill, the Bill being simply for their advantage, and for the improvement of the supply. This is the case on the present occasion, and so far as I understand the arguments of the hon. gentleman, I do not see any objection to it in this instance. There is no proposed increase of the rates; there is no deterioration in the quality or decrease in the supply, and the Bill has for its object solely the improvement of the works of the Company under powers which they already possess. The merits of the Bill are, therefore, in my opinion, very clear. I do not, however, remember that the Bill has already been approved of by a Committee of this House, as well as by a Committee of the other House, and that it has received the careful consideration which all Bills receive at the hands of the right honourable gentleman the Chairman of Ways and Means, and that the House has received the same consideration. I will not, therefore, say that the Bill is not to be allowed to be heard. If I may return for a moment to the merits of the case, which I have heard now for the first time from the honourable member who moved the rejection of the Bill, I think the House will arrive at the conclusion that the objection to the Bill is not a new one, but one which has been made since the origin of the Company, whatsoever may have been their past faults, these, of course, would have nothing whatever to do with the present proceedings; and with them the Committee had nothing to do. The honourable member told us that the Company is managed by gentlemen in London, who have no connection with the district, and who do not understand its requirements. If this is so, it is a complaint against the Act under which the Company was constituted, and can in no way be applied to the present scheme, which simply authorizes the application of capital, which already exists, to the improvement of the works of the Company. I do not see any objection to it with regard to the other objection against the Bill. I dare say the Company is authoritatively constituted, and that there is no power of checking their accounts, and it may be that all the objections the honourable gentleman has urged against the Company exist. But I think that the House, in coming to a decision, should not be misled by remedied or made worse by the present scheme. I do not know whether it is a fact, but it is stated that the promoters of the opposition wish to purchase the Company's undertakings, and that they at present have no power to do so. If they wish to purchase, the proper course is for them to apply to the Court of Referees, and to ask for powers to do so. The Company now before the House simply proposes the improvement of their works, and contains no clause compelling them to sell the undertaking which the promoters of the opposition wish to purchase, and with which the present Company have not the slightest wish to part. The objection to the Bill is not a new one, but one which has been made since the origin of the Company, and I hope I have convinced the House that, according to the practice of the Court of Referees, the petitioners had no right to be heard, and that the honourable gentleman has not made out any case of hardship, or any grievance which would justify the House in departing from the usual practice.

Dr. LYON FRANKLIN (Chairman of the Committee of Ways and Means) said: I would ask the House to consider what happened yesterday (when there was a long discussion on a Railway Bill, which was thrown out on the third reading, and upon the Rathmines and Rathall Township Water Bill, given above, and what happened to-day, because I think it could be a very interesting discussion. Private Bills are introduced at the session, and at great length, in this House, tends to stop the ordinary course of business. Yesterday a Bill, which until then was unopposed, occupied several hours of the time of the House. To-day a Bill unopposed hitherto, as far as the House of Commons is concerned, has been thrown out, and I think it is a very exceptional case indeed to justify the House in throwing out a Bill in its last stages. There is certainly something exceptional which would justify Hanley in being a little jealous as to the increase of capital of this Company, and if Parliament had the power to give the Company the power to increase the capital, and to the locality, and to give them power to govern the whole district, I do not think it likely that Parliament would give such a company that power. But it must be remembered that this is a Company which was established 30 years ago, when the manufacture of gas was not so profitable as it is now, and when the price of gas was high, and the price of coal was low. The Staffordshire Potteries, to go to Hanley and assist them in making gas and providing light for the locality, and two Acts of Parliament, I think in 1855 and 1856, gave them the powers by which they are regulated. The conditions are not very onerous. The Staffordshire Potteries must supply gas at 8s. 6d. per 1000 feet. The Local Government Board, in some other cases, have sanctioned 6s. and even 7s. per 1000 feet as a maximum; and I have remonstrated, as Chairman of the Committee of Ways and Means, and have reduced the maximum to 4s. 6d. per 1000 feet. Here they are to be supplied with gas at a maximum of 6s. 6d. per 1000 feet, which cannot be considered a high price. The Company have established themselves in the Staffordshire Potteries, and, no doubt, they carry on a fairly remunerative trade. On £40,000 of their capital they have 10 per cent. dividend, on £30,000 they have 7½ per cent., and they now ask to raise £50,000 on which they are limited to 5 per cent. These conditions are not onerous, and the House, when it comes to consider this Bill, should see that it is a remunerative undertaking, now wishes to carry

on its own gas-making, and wishes to purchase the Company's works; but the Company, having at last made the works remunerative, do not wish to sell; and Parliament has never yet given compulsory powers to a Corporation to buy or undertake against the wish of the proprietors of that undertaking. Therefore, though Hanley has a perfect right to come forward and promote a Bill and see whether Parliament will give it compulsory powers, it is at the same time quite natural that the Company should seek to defend their rights. Consequently I do not think the House should throw out the Bill on the third reading.

Colonel MARTIN: I am not going to take up the time of the House to repeat what was said yesterday, because I do not think the House will adopt the amendment proposed by the honourable member. The fact is, the honourable member has played the part of Ahab. He wants to have this vineyard, or gas-works, or the like, to be the part of Jezebel. (Laughter.) I hope the House will do nothing of the kind. The Gas Company has carried on its business under an Act of Parliament, and if there is any pretence of complaint on the part of the inhabitants, why do they not proceed against the Company, as the Act provides, for the recovery of penalties? The fact is the Bill has gone through every stage of inquiry through the House of Lords and through the House of Commons, and now meets with unlooked-for opposition in this House at the last stage. I am quite sure that anything in the nature of a motion like this has never before been presented to the House, and that there is absolutely no precedent for the House of Commons throwing out a Bill of this kind, under such circumstances, on the third reading.

The House then divided on the question, when there appeared—
For the third reading 70
Against it 29

Majority

The Bill was accordingly read the third time, and passed.

HOUSE OF COMMONS COMMITTEE.

WEDNESDAY, JUNE 9.

(Before Mr. ARTHUR SMITH, Chairman; Mr. H. B. SAMUELSON, Lord MORTON, and Baron HENRY DE WORMS, Mr. BONHAM-CARTER, Referee.)

CORK GAS BILL.

Mr. RICHARDS, Q.C., and Mr. MICHAEL, Q.C., appeared for the promoters: Mr. GRANVILLE SOMERSET, Q.C., Mr. F. CLIFFORD, and Mr. FREDERICK STEPHENS for the Corporation of Cork; and Mr. YOUNG for consumers of gas in Cork and its vicinity, petitioners against the Bill.

Mr. RICHARDS, in opening the case for the promoters, described the Bill as one for granting further powers to the Cork Gas Consumers Company—viz., to alter the price charged for gas, and also the dividends the Company were authorized to pay under their former Act. The Company were originally registered under the Joint-Stock Companies Act; and in 1857 entered into possession of their present works and plant, and in 1858 they contracted for the lighting of the public streets of the Corporation, and of private consumers. At that time another Company was in existence in Cork, known as the United General Gas Consumers Company, and a competition of a ruinous description was carried on, until, in April, 1859, the latter Company were obliged to retire, having sold their plant to the promoters of the present Bill. In 1859 the Corporation of Cork introduced a Bill in Parliament, in which, amongst other things, they sought power to make and supply gas to the city of Cork, at a cost of 5s. per 1000 feet within the borough and 6s. per 1000 feet without, and at the same time the Gas Consumers Company promoted a rival scheme, in which they offered to supply the gas at 4s. 3d. and 5s. 6d. respectively. Some negotiations took place, and, in the end, the Corporation withdrew the gas clauses of their Bill, and the Company's measure was passed unopposed. By that Act the Company were enabled to raise £150,000 in shares, with a dividend limited to 8 per cent., and to borrow £37,500 on debenture stock. The Illuminating power was to be 4s. 3d. and 5s. 6d. and the price 4s. 9d. per 1000 feet within the borough and 5s. 3d. without. The Company continued to pay 8 per cent. until 1873, when, in addition, they put by a small sum as a reserve-fund, which they were perfectly entitled to under their Act. In that year the coal famine occurred, when prices rose to an unprecedented height, and the Company's measure was absolutely threatened with ruin. To meet this emergency, an Act was passed by Parliament, known as the Gas and Water Works Facilities Act, 1873, under which power was given of applying to the Board of Trade for permission to charge an increased price for gas for a limited time, to meet the extra cost of production. The Corporation applied to the Board of Trade with this object, and an inquiry was held at which the Company were opposed by the Corporation, who had engaged Mr. G. W. Stevenson to support their case; and this gentleman stated that the whole management of the Company was extremely reprehensible, especially in the matter of unaccounted-for gas. The leakage at that time amounted to 20 per cent., whilst Mr. Stevenson stated that 10 per cent. was an ample allowance. Mr. Vernon Harcourt, however, who conducted the inquiry for the Board of Trade, decided that 15 per cent. would be a reasonable amount to allow for unaccounted-for gas, and he ultimately granted the Corporation permission to charge 12s. 6d. per 1000 cubic feet for a period of two years. In 1879 the contract with the Corporation for public lighting expired, and the Company offered to renew it at the reduced rate of 4s. 3d. per 1000 feet, but at the same time refused to be content with a sum of 3d. per 1000 feet for repairs to plant, &c., which they then allowed to be made, and the Corporation, having found that this amount had by no means covered the plant, &c. incurred; but the Corporation would not consent to any increase, and some bad feeling arose, which had culminated in the present opposition. The additional capital asked for in the Bill was £35,000, with borrowing powers to the extent of £20,000. The new capital was to be raised on the new capital was limited to 5 per cent., and on the old to 7 per cent. The promoters had also incorporated the auction clauses, according to the Standing Orders of the House. The learned Counsel then proceeded to deal with the petition against the Bill, which, he said, were signed by people who were not interested in any way in the Company, and several of whom were neither ratepayers nor gas consumers.

The following evidence was called—

Mr. Denny Lane, examined by Mr. RICHARDS.

I have been Secretary to the Cork Gas Consumers Company since its formation, in 1856, under the Joint-Stock Companies Act. By the powers of a local Act then existing, we had authority to open the streets so long as we were contractors for the Corporation, who were allowed to contract for a period not exceeding three years. At the time of the formation of the Company the city of Cork was supplied by the United General Gas Company, as were likewise a large portion of Dublin and also the city of Liverpool. This Company was put out in 1859, and the Corporation, as the sole suppliers of gas in Cork. In 1859 we obtained the Act of Parliament under which we are now working. Under this Act our prices were limited to 4s. 9d. within the lighting district of the Corporation, and 5s. 3d. without—this, we charge 6d. more where there are no public lamps. The principal clauses in the Act were agreed by agreement with the Corporation, and I had also introduced a Bill in the same year, for the erection of gas-works

in competition with ours, but this Bill was subsequently withdrawn. The prices proposed to be charged by the Corporation were 5s. within the borough and 6s. outside. The present number of Shareholders in the Company is about 250, the Capital £150,000. Since 1858 our coal consumption has increased but slowly as compared with that in English towns. During the years 1870-71-72 the Corporation paid a dividend of 8 per cent., but in 1873-74 the year of the coal famine—they only paid 6 per cent., but the difference was subsequently recouped to the Shareholders. In consequence of the continued high price of coal, an application was made to the Board of Trade, under the Gas and Water Works Facilities Act, 1873, for a Provisional Order to enable us to increase the price of gas, and Mr. Vernon Harcourt was appointed to hold an inquiry, at which we were opposed by the Corporation. Mr. G. W. Stevenson, who was one of the witnesses before the Corporation, made a statement that the coal was excessive; its amount, 20 per cent., while the Corporation stated that it only ought to be 10 per cent. Mr. Harcourt, however, in his report, intimated that under the peculiar circumstances existing in Cork, he thought 15 per cent. would be a fair allowance. He also allowed us to make an additional charge of 6d. per 1000 feet for two years, and we were accordingly charged in 1874 and 1875, during which period we declared a dividend of 5 per cent., which was all that was allowed under the temporary Act above mentioned. In 1876 we paid 8 per cent.; and in 1877, 8 per cent., and 2 per cent. additional to make up the deficiency in 1878. Previously to 1873 we had a reserve-fund, but this was consumed in consequence of the advance in the price of coal. It fell from £10,000 at the beginning of 1873 to £371 in 1874; but it has been increased again since that time, and the last accounts show an item of £10,821 5s. 6d., in which interest is included, the fund being invested in railway and harbour debentures, both of which are thoroughly sound. Our present price is the 6d. within the lighting district and 3s. beyond, in the case of meter-run. The contract for the public lights at the end of 1879 was at the rate of 4s. 3d. per 1000 feet, calculated on the average meter system, one meter being attached to every tenth lamp. We also contracted to do all necessary repairs for 3d. per 1000 feet. The metered lamp ought to be arranged as the Corporation carried the ten, but it was carried by our Manager—Mr. Travers—such was not the case, and last October we had an interview with the Corporation upon the subject, and sent them a copy of Mr. Travers's report, to which we did not receive any reply till last month. The lamps are lighted by the servants of the Corporation, and the effect of the extra cost of the lamps is to make the ten lamps appear to burn much less than they really do. At our interview all the members of the Corporation who were present were as strong in condemning the system—if it could be proved—as the Directors themselves were. The contract with the Corporation expired in 1879, but in the meantime the Corporation had negotiated with the Corporation at the old price of 4s. 3d. per 1000, although we objected to the 3d. for repairs, as we found it did not pay our expenses out of pocket. We offered, however, to do all the repairs for the actual sum expended for labour and materials; but on that matter no conclusion has been arrived at, and an immediate arrangement has not been made, and we have drawn our offer. At the present moment, therefore, there is no contract for the public lighting of Cork. We furnished the accounts for the quarter ending April 1 at the price of 4s. 3d. per 1000 feet, and we also added the amount expended for labour and materials for the repair of the lamps. The accounts were in the hands of the quantity of gas consumed. But the Gas Committee informed us that they were not prepared to sanction any increase upon the former price charged for repairs. The first suggestion in reference to the sliding scale came from the Corporation at the meeting to which I have referred, and it was then agreed to by the Company. The ordinary and large quantity of gas consumed by the Corporation have not in any way contributed towards their cost. In a pamphlet issued by Mr. Stevenson, he says that no objection can be made to the amount of additional capital proposed to be raised, nor to the mode to be employed; but he goes on to say that a differential price within and without the borough is a source of complaint, and that I cannot conceive how he can have arrived at such a result. There are in the pamphlet other charges which are also embodied in the petition against the Bill—viz., that the Company do not make a sufficient quantity of gas per ton of coal carbonized, that the unaccounted-for gas is excessive, and the cost of the gas is too high. These allegations are based upon comparison with the London Companies. The petition states that the London Companies produce 10,180 cubic feet per ton of coal, whilst the Cork Gas Company produce 8960, showing a difference of 1220 cubic feet; but during the year in which Mr. Stevenson made his comparison, the Corporation were burning a few tons of Welsh coal, the remainder being from new coal, and with this combination we have produced gas of the quality required by our Act of Parliament—viz., 14 candles. The Corporation have a testing office, and the gas is tested every day, but we have never had any penalties exacted from us, nor have we had a single complaint for some years past as to the illuminating power. The Directors have always instructed the local Engineer to give a good quality of gas, and to be well above the standard he was bound to give. With regard to unaccounted-for gas, Mr. Stevenson says ours ought to be reduced to 10 per cent., and he compares it with London, where it is only 6 per cent. It would be very curious to see the Corporation selected in London, or in London, or in some other town in Ireland. His calculation is founded upon an utterly erroneous basis. Suppose on a mile of main, for instance, there is a consumption of 2 million feet, while only 1,600,000 feet are delivered, this would be a waste of 20 per cent.; but if the consumption of that main was 1,600,000 feet, the waste of 400,000 feet would be a waste of 25 per cent., although the percentage will have fallen off. The centre portion of Cork consists of a number of small islands, and formerly there were a series of canals, with trees on either side; but subsequently these canals were covered over, and, in fact, at present there is a great portion of the ground in the city, and the locality rests upon a substratum of mud, and in consequence the ground is extremely unstable; so much so that the cars passing through the streets will make everything vibrate. Outside the city, the outlying districts rise to a great height, the barracks being nearly 300 feet above the city, and consequently it is that we have a sufficient pressure to burn gas. Now parts we must have an excessive pressure at the higher parts, thus causing a large amount of leakage. There is also this disadvantage, that the mains after rising have to descend again; and if we introduced street governors there would be no gas where the main descended again. The item of leakage of London per mile of main, our leakage would not be more than 6 per cent. The great extent of mains in an Irish city like Cork cannot be utilized as they are in London, because of the great poverty of the population, and the small number of persons in the city, and the small number of houses. This closing movement also prevails very much in Cork. With the exception of public-houses and a few other shops, all establishments are closed at six o'clock, except on Saturdays, when they remain open till eleven, the result being that the pressure remains in the pipes, and it simply is not a matter of course that a small number of the lights. I believe were it not for this cause our leakage would be 2 or 3 per cent.

less than it is. The only manufactories we have in Cork are three distilleries, four breweries, and two or three small foundries. On Mr. Stevenson's third point—the expense of manufacture—the first error I think he makes is one of arithmetic. He compares the expenses of London and Cork upon the number of feet of gas sold, which is certainly a mistake. For this reason there must be more uniformity in the rates in London, which gas cannot be produced without labour, wear and tear, and so forth; and therefore the comparison should be between the expenses per 1000 feet of gas sold, and not per 1000 feet made, in which case, with certain allowances, it would be in favour of Cork. There was one circumstance of which Mr. Stevenson certainly had no knowledge—viz., that the cost of gas in Cork is greatly increased by the enormously high taxes which have to be paid by the Company. In the two half years ended Dec., 1878, and June, 1879, the rates upon the gas made in Cork amounted to 3s. 9d. per 1000 feet, while in London, in 1878, they were only 1s. 4d., and there was a difference of over 3d. per 1000 feet. Another matter to be taken into consideration is that in Cork all our holdings are under a lease-farm grant, upon which an annual rent is paid, instead of being purchased with capital. We pay £300 a year, which at 80 years purchase—although we have no compulsory powers of purchase—would amount to £9000, and I put this down as an equivalent upon the gas made in Cork at 0s. 9d., which are 1s. 4d. less than London if they are paid for company, and the two places reduced to equal terms. In explanation of my statement that our rates are very high, I may state that the general valuation of Cork is a very old one, and has not been revised, while the valuation of the gas-works has, on the other side, been revised, the consequence being that we are rated to the full amount. To give an example, I have a tenant who pays me £50 a year rent, but the valuation of his premises is only £22 a year, whereas if he were valued in the same way as the Gas Company, it would be at least £44. The consequence is that if there were a revaluation in Cork, the gross amount would become so much that we should come down to the standard rate, but as the rates are not revised, and revalued where the old valuation could not be changed, the consequence is that we mean to say it is an exorbitant charge on the part of the Corporation, but the rates are remarkably high, in consequence of the differences in the valuation. Our office expenses are proportionately heavier than they are in London, in consequence of the small number of persons. There has been a diminution in the unaccounted-for gas within the last few months, owing to the large outlay incurred by the Company in taking up service-pipes and relaying them in an asphaltic composition, and by an examination of all the mains in order to discover the leaks. In some portions of the city the leakage was over 10 per cent., this was actually caused by the steps we were taking to diminish it in the future, because in breaking the connections and inserting new services, a certain amount of gas always escapes. It is now about 15 per cent., which I think is as low as it ever will be on an average in Cork, unless there is an increase in consumption; if this were doubled, the leakage would go down to 7 per cent. I have seen the petition supposed to be signed by consumers, but some of the persons who have put their names to it are not consumers at all; and some of the leading members of the Ratepayers Association pay neither rates nor for gas, for they do not reside in the city at all. Six out of the seven of the leading members of the Association are attached to the petition, but of those two or three who have signed it they did not sign, and that their names were placed there without their consent. The annual value of the consumption of one gentleman who signed is 18s.; but there are several others higher than this. I think the standard price of 6d. in the retail is fair and reasonable, but it would have to be reduced to 8s. 10d. without the meter-valuation, but we could pay 10 per cent. dividend. The standard price in London is 3s. 9d., The Gaslight and Coke Company charging 3s. 5d., and, under the sliding scale, paying 11 per cent., in consequence of having reduced 10 per cent. by 4d. in the retail, and 1s. 4d. in the wholesale, and a comparison between Cork and London, at the present moment, is extremely low, and convey no test at all; but any one looking at the map, and seeing the distance between Newcastle and London, and the navigation all round the South of England to Cork, would know they must, in ordinary cases, be higher to the latter than to London. A vessel of 1200 tons would take five days to discharge in Cork, whereas in London, with hydraulic machinery, it can be done in a single day, and of course this would require a much higher rate of freight.

Cross-examination by Mr. GRANVILLE SOMERSET: The harbour dues in Cork are only 1d. per ton, but there are some small Mayor's dues besides. Conveying costs of the harbour are about 8s. per ton, and the carriage and 4d. from the firm. In the original prospectus of the Company it was stated that the dividend was to be restricted to 8 per cent., and that any excess should go towards a reduction in the price of gas. Subsequently, in 1864, an attempt was made by the Company to extend the dividend to 10 per cent., but the old inhabitants of the city were so much alarmed with breach of faith thus contemplated, and the Directors were requested to summon a meeting of the Shareholders on the subject, at which the original limitation of dividend was restored.

Mr. RICHARDS: I would like to know what was the matter which occurred previous to the Act of 1868.

The REFERENCE said that technically the cross-examination was in order, but the Committee felt that going so far back into the history of the Company was rather out of the way of the issue now being tried.

Cross-examination resumed: I am not aware whether the Gas Companies south of the Thames charge meter-rents, but I know some of the London Companies do so. The Gaslight and Coke Company receive £36,000 a year from this source. The population in the municipal borough of Cork is 80,000, but in the parliamentary borough it is 100,000, because a part of the city is a good way out of the city.

Mr. SOMERSET: Mr. Stevenson, in his pamphlet, states that from June, 1878, to June, 1879, "21,558 tons of coal were carbonized, showing 8960 feet made per ton and 7231 feet sold." He then adds: "These figures are so startling that I venture to say that there is scarcely a Company in England or Scotland working so badly as the Gas Company." What do you say to that?

Witness: My opinion is diametrically opposite.

That does not embrace London alone, but the whole of the United Kingdom? What place would you like to compare with Cork?—I should

think the most convenient place would be Dublin or a town in the South of Ireland; but I do not know of any place which is exactly similar in circumstances.

Cross-examination continued: At the present time the Company have about 700 shares uncontracted, representing £8500, and also certain borrowing powers. The contract between the Company and the Corporation was not renewed, because the latter refused to pay more than the 3d. for repairs which had been previously agreed upon. If we obtain our Bill we shall have to consider what fresh terms we shall make, and in case of non-agreement the price can be fixed by an arbitrator. During the two years in which we divided only 5 per cent. we were under the provisions of the Gas and Water Works Facilities Act, 1879, but this Act has since expired. The opinion of our Board was that we were not entitled to divide more during that period, although some lawyers were of opinion that we might have done so. The Directors, however, thought that, whether legally or not, they were not morally entitled to take that course.

Mr. SOMERSET: Under the Act of 1868 the Corporation appointed one of the Auditors of the Company, and in August, 1879, the Corporation Auditor said: "After having gone into every sort of calculation, I respectfully submit that the consumers have an equitable if not a legal right to participate in the surplus profit." Were the consumers affected to such an extent as to act upon that suggestion?

Witness: By adopting the sliding scale the consumers will participate in the profit. We have already reduced the price from 4s. 9d. to 4s. 6d. to the public, and 4s. 3d. to the Corporation. It does not say the consumers shall have the whole of the profit, but that they shall participate. The Corporation has no right to take any future additional profits we can make as to be divided in the proportion of two-thirds to the consumers and one-third to the shareholders.

Cross-examination continued: The balance at the foot of the profit and loss account for the last half year was £6394, out of which we paid our full dividend of 5 per cent. on the £2000, and the balance of £1394 was put in a fund of £2000; depreciation fund, £700; and a suspense account—in a case where a banker had failed—£498. In explanation of the latter item, I may state that a former Accountant had run away, taking money from us which was afterwards recovered. Considerable expenses, however, were incurred in pursuing him, and in sending our correspondents abroad, who had been authorized to seize the man, had bills of exchange called in. Bowles Brothers. The money was remitted to us, but before the bills arrived in Cork the bank failed, and we kept the amount in the accounts for a long time, expecting to receive a dividend out of the estate; but finally, finding this was not likely, we thought it ought not to be put down as a dividend, but as a suspense account, and therefore it was written off as a loss, and comes out of the reserve-fund.

Mr. SOMERSET: Out of the consumers fund?

Witness: Possibly, in the end.

How much did that gentleman run away with?—£2700.

Did you have any objections to the consumers?—No; he was arrested in Geneva, and the money was found upon him.

But you cannot reduce your rates if you let your people run away with £2000 or £3000?—Very much worse things have happened in the London Companies. So far as this item was concerned, it was simply an accident to which all commercial companies are subject—viz., failure of the bankers.

At a meeting held last week did you not say that you did your work better than the London Companies, and that you were prepared to supply gas at 3s. 9d. per 1000 feet?—I said we could give London prices, London dividends, and London illuminating power, if we had as they have in London, meter-vents, and in addition to the London price the excess of rates in Cork per 1000 feet to be determined by any auditor who should be appointed.

Did you not say that you could pay 10 per cent. with a price of 3s. 9d. per 1000 feet, and proposed a sliding scale, that would allow us to pay 10 per cent., but I did not say we could sell gas at 3s. 9d. per 1000. I pledged myself that the Company could reduce the price to 4s. 2d. per 1000 from Jan. 1 next, but I did not say they could therefore pay 9 per cent.; and if they did perhaps the only way they could do it would be by taking it out of the reserve-fund.

You are reported to have said, "The proposal was to supply gas at the same price as the Chartered Gas Company in London—viz., at 3s. 9d. per 1000 feet, with 10 per cent. dividend, 5s. per cent. reduction for every penny added to it, and 6s. per cent. increase for every penny charged under it?"—Yes, that is perfectly correct.

THURSDAY, JUNE 17.

Mr. Denny Lane was recalled and cross-examined by Mr. YOUNG as to the position and amount of consumption of the parties who had signed the petition against the Bill.

Cross-examined by Mr. CLIFFORD: In the half year ending December, 1879, the cost of coal from Newcastle, including freight, was 7s. 9d.; exclusive of freight, 6s. 8d. The previous half year it was 6s. 3d., and the half year before that 6s. 5d. I cannot give the freight of Welsh coal, but the cost delivered to the stores was 12s. 10d. and 12s. 10d. per ton. The cost of coal delivered to the stores was 12s. 10d. per ton. The cost of coal delivered to the stores was 12s. 10d. per ton. The cost of coal delivered to the stores was 12s. 10d. per ton. Those sums do not include the expense of wheeling the coal from the stores to the retort.

By the REFERENCE: In the year 1876 the average price for all our coal was 14s. 10d.; 1877, 14s. 3d.; 1878, 13s. 3d.; and 1879, 12s. 10d. During the greater part of the year there was an extraordinary depression in the coal market, and also very low rates of freight; so that those years cannot be taken as a test. In 1868 the price was 13s. 9d.; 1869, 14s.; 1870, 14s. 6d.; 1871, 15s. 3d.; 1872, 17s. 9d.

The REFERENCE: Then you must have been beginning to feel the coal famine when we reached 17s. 9d.?

Witness: When you found that coal we had no stock, but it was before the famine. We frequently had contracts running, and bought the coal before it was required.

By Mr. CLIFFORD: During the period mentioned we were using a much larger proportion of Welsh coal than we do now.

By the REFERENCE: During some of the years I have mentioned we did not use any Newcastle coals; in one year we only used 97 tons; in another only 57 tons; and in another 146 tons; so that the prices I have given were for Welsh and Wigan coals, not Newcastle. The freights and prices of Newcastle coals were so high that we found it more advantageous to use a mixture of Welsh and Wigan coals. In the course of five years we only used about 3000 tons of Newcastle coal out of a total of nearly 120,000 tons. The Wigan coal was very deficient in coke, but the Welsh coal gave a large proportion. As a general rule, whenever a coal gives a large quantity of coke it gives a large quantity of gas. Taking both coke and coke into account, Newcastle coal is the best; but for coke some of the Welsh coals exceed it, while for quantity of gas and illuminating power the Wigan coal exceeds it.

Mr. George Anderson, examined by Mr. MICHAEL.

I designed the Committee Gas and Water Bill, and have been Engineer since that time. I visit the works several times in the course of the year. I have read the report presented to the Corporation of Cork by Mr. Stevenson, in which a complaint is made that the pro-

motors of the present Bill do not manufacture gas so cheaply as it is done in London, and I was surprised at it. The comparison is not fair, and when I come to the estimates I have prepared I will prove it. Mr. Stevenson has only taken part of our expenses, and argues from these as if they were the whole. He only takes the revenue account, and leaves out all the expenses in the profit and loss account, and by so doing he brings out his price to something like 3s. 6d. per 1000 feet. It is notorious that the expenses of the Cork Company are vastly greater than those of the Cork Company, and in consequence it is easier to sell the gas at a lower price. I have prepared a comparison of the leading items of the manufacture of gas in London and in Cork. According to Mr. Stevenson's report, he takes out figures as to the actual cost of our coal, which are quite correct, amounting to £504. per 1000 feet of gas sold. He also takes the expenses of our revenue account, which includes stokers and purifying men. Then he takes the expenses which are found in our revenue account, amounting to 23s. 9d. per 1000 feet, and also our interest on shares and debentures, amounting to 17s. 6d.; and these together work out to 46s. 9d. Among the items which Mr. Stevenson omitted to take was one of "Banks charges, £328 13s. 4d." We have a small working capital, and the bank allows us to overdraw, and they charge banking interest. Then there were general charges amounting to £651 3s., and a payment of £91 0s. 9d. for insurance. There is also the item of £24 13s. 5d. for law expenses; and also the item of £100 0s. 0d. for sundries, which amount to £196 2s. 1d. The total of the items omitted amounts to £1291 12s. 7d., or 12s. 9d. per 1000 feet.

Mr. CLIFFORD: Is this per 1000 feet sold or manufactured?

Witness: The figures I am now laying before the Committee are for gas as manufactured. The figures for the profit and loss account, Mr. Stevenson's balance-sheet of the Company are also omitted by Mr. Stevenson. In the account to June, 1880, we placed £200 to insurance, and £500 to depreciation—amounting to 15s. 4d. per 1000 feet of gas made. If those items are added to the sum Mr. Stevenson arrived at before these were calculated, it brings up the price to 50s. per 1000 feet.

Examination resumed: The difference between my estimate and that of Mr. Stevenson is about 11s. 4d., which I think is under the mark. The estimated cost of the gas is on a basis of coal at 1s. 4d. per ton, with a production of 9800 feet. I am aware this price is a little higher than we are actually paying at present, but we are not sure of the exact price of the coal, and not so high as we have paid in the past, irrespective of the coal famine. In 1870 and 1871 our average price was about 15s. 5d. delivered in Cork Harbour—that is, Newcastle coal—to which must be added insurance of the coal, seaport dues at Cork, and a small gratuity to the captain, and also the expense of the cartage to the works and the wages and trimming, which I have taken at 1s. 6d. Mr. Lane has given the figure at the present time as 1s., but this is 50 per cent. under the price other companies are paying for similar work, and it would be unsafe for any company to be limited to such a low price as Mr. Lane is talking at. The price is now brought up to 17s. 6d. per 1000 feet; and there is the labour in the retorts—coal stoves, purifying houses, &c., which I take at 5s. 6d.; wear and tear of retorts and works, 3d.; purifying materials, 1d.; and water, oil, and sundries, 1d.; amounting in the whole to 27s. 11d. Then we get something back for our residual products, which I take at 60 per cent., and which is a high amount to receive, because when we take a larger quantity of coal, the residual products are, and therefore the residual products are larger than they would be if we were using a better class of coals. This amounts to 10s. 6d., leaving the net cost of gas into the holder at 16s. 6d. The gas has to be distributed to the consumers, and we require for this the cartage to the works and meters, 3d., and expenses of public lighting 9s. 6d. per 1000 feet. We actually pay for rents £314, and rates and taxes £490, which amounts to 3s. 7d. per 1000 feet. We pay salaries to the amount of £1950, equal to 23s. 4d. per 1000; and general office expenses £450, equal to 5s. 4d. per 1000. All the items in giving the Committee are actually extracted from the accounts. Then we have our Directors and Auditors' salaries, which come to 10s. 4d. per 1000; and there are also general charges, £445; insurance, £72; bad debts and allowances, £300; law expenses, £20; and allowances on disputed accounts; the last five items amounting to 7s. 22d. per 1000 feet. Then I take the depreciation on the plant, which is 10s. 0d. at 10 per cent.—which is 1s. 2d. per 1000 feet. The whole is £35s. 0d., which is 8 pence per cent. to 13d. per 1000 feet. I also allow for the renewal fund 3d. per 1000 feet, which is a low sum, because in our case the whole of the meters are given free to the public. We have £10,000 worth of meters, and we are not getting them out of the public; and I consider no company is safe, under those circumstances, unless it has a reserve fund of 10s. for meters, even beyond the ordinary repairs. Meters will last from 15 to 20 years if they are well cared for; but if they are put into a damp place, or where there is salt, they will be rendered useless perhaps in half a dozen years. Besides the meters there are also our two holders, our main and service pipes, and, in fact, all our works. I may observe that 3d. is less than the statutory deduction we were allowed on a recent occasion when our rating was under examination by the valuers in Dublin on behalf of the Government.

Mr. MICHAEL: Is it the proper course of conduct that when any renewal takes place it should be charged to revenue?

Witness: I do not think so. Wear and tear from year to year should be charged to revenue.

Where a new thing is taken for enlargement, the measure of the enlargement is charged to capital, but the replacement is charged to revenue. The same principle applies to the case of the gas works, which we get in excess, and the consumers will be charged a price for gas which they would not otherwise be.

I wished the Committee to understand that you are charging against the Company the interest of the consumers—I am doing so, but I think it is the right thing to keep the capital down to the lowest possible point.

Examination continued: For the renewal fund I want 3d. per 1000 feet, the total then being 45s. 27d. We have manufactured our gas, and have put a certain quantity into the holders, but we do not get paid for all the gas. I have seen that the Company have received payment for 85 per cent., allowing 15 per cent. for unaccounted for gas, which is the case in Cork. This amounts to 53s. 2d. as the cost of the gas at the consumers meters, or 4s. 5s. 2d. to be charged. I have not asked for anything for contingencies which might arise, or for a reserve fund. If we had to pay for coal the same price as we did in 1870—15s. 5d. per ton—taking everything else in the way of I have now done, the cost of gas would work out to 4s. 9d. per 1000 feet. Mr. Stevenson having compared our Company with London, and London only, I have considered it advisable to examine the London Companies' accounts, and see how far his statement is correct, that is, the price of the gas at 10s. 0d. per ton. I have taken the Gaslight and Coke Company, which is the more adverse to myself, being so extremely large. I take 54d. for labour, 3d. for works and repairs, and 3d. for outside repairs, making 11d. I also lay before the Committee the statement of the London Companies' accounts for the same items that are included in this Bill, and it will be found that we are not excessive in our cost of manufacture. My summary shows that while the London Companies paid 11s. 9d. per 1000 feet for these items,

our expenses last year were only 11s. 0s. 4d., so that we are actually manufacturing gas cheaper than they do it in London. I may state that the cost of our clerks and office expenses altogether are not more than double what they are in London, but not more than they are with other companies similarly situated to ourselves and of like magnitude, and this is a reason for our having a higher price in Cork than in London.

Mr. MICHAEL: Of course the same servants are required for a large company as for a small one. You cannot divide a secretary or an inspector of meters, and so on?

Witness: Just so; but it goes much farther than that. Our consumers are numerous—perhaps 4000 or 5000—but there is a very small consumption. We have to make out accounts to some gentlemen who only consume 8s. worth of gas in the year.

Examination continued: We pay great attention to all complaints which are made; in fact, we do for the consumers in Cork what is not done in London. If a consumer in London makes a complaint, the Company simply look at the meter, and if it is all right they say they have performed their duty; but we have a staff of men who go right up to the burner, and we make no charge for this. I find that some companies out of London—viz., at Dover, Brighton—and do the same, and I have the accounts before me. One pays 12 pence of the cost of coals on account of salaries; another pays 16, and another 20. The average of the whole is 17 pence per cent. in Cork it is 1s. 6d., which is a made under the Surrey Consumers Company pay only 9s. 9 pence; the Commercial, 6s. 5; Crystal Palace, 6s. 16; and The Gaslight and Coke Company, 4s. 7 upon the cost of the coal for the whole of their salaries, and this shows that the amounts vary exactly according to the size of the company. The average of the London Companies is 1s. 6d., which is a made under the Surrey Consumers Company pay only 9s. 9 pence in Cork on this account alone.

Mr. CLIFFORD: Do those figures include Directors' fees?

Witness: Yes; and so do those I have given for ourselves of 16s.

Mr. MICHAEL: You have compared like with like in your own and other companies.

Witness: That is exactly what I have done. In our last year's accounts there appears only about £149 for purifying materials. Mr. Stevenson accepts what is excessively low, but does not say a word about it, and he would, I suppose, fix us for ever. There were peculiar circumstances, however, which may account for this. In our last year's account we had a large quantity of purifying material, and we were working upon that. In Hove, Dover, Brighton and South Shields, where the Gas Companies are all pretty large, the percentage of the cost of purification to the cost of coal is 1s. 16d., and in London it is 1s. 7s. 5d., while in my estimate before the Committee it is 1s. 6d. per 1000 feet.

Examination continued: With regard to the allegation that we do not make sufficient gas from our coal, I think Mr. Stevenson may have been misled on this point. He seems to have had London on his mind all through his report, and no doubt in London they do make a very large quantity of gas from our coal.

Mr. MICHAEL: Do they use the same coal in London?

Witness: This is what, perhaps, Mr. Stevenson does not know. He took it as Newcastle coal, whereas we have for a number of years used a large quantity of cheap Welsh coal, which produces less gas but a great deal of coke. If we used the same coal at 8s. per ton, under Newcastle, we may use it, either one or the other, but if the difference is greater use the Welsh in preference.

It is a fact that there has been great progress in the manufacture of gas during the last ten years, so that a much larger quantity per ton of coal can be obtained now than was formerly the case? That is a statement in Mr. Stevenson's report which I deny. I am an old man, but I have been at the gas-making trade ever since I was a boy, and I say that we knew as much about the manufacture of gas—as so far as the quantity to be obtained was concerned—30 years ago as we do now. At that time, however, the gas was not so thick taken out of the coal as we now get. In Cork we are content to take rather less out of the coal, and prefer good quality of gas rather than squeeze the coal to the last drop, when it would follow as a necessity that the illuminating power of the gas would become diminished.

Examination continued: The Company have done their best to supply a good article; sometimes it has been 16, sometimes 16s. 1, and sometimes 17-candle illuminating power. Our gas is, I believe, tested daily by the Corporation; at all events, I know that it is done very often. The freightage has been so excessively low for the last year or so that I know as shippers who have only been running their vessels because if they laid their cargo in the water they would lose the cargo. I am an old man, but I am shipowner myself, and once had, with some other gentlemen, four ships, and we could never run those vessels to Dover under 6s. per ton, while we have had vessels go to Cork as low as 5s., although I must admit they were chance vessels. The freight to Cork used to be about 1s. 6d. above Dover, and 2s. above London. I do not think it likely that our present low average in respect of coal and freight will continue; in fact, for the sake of the nation, I should hope it would not. We have taken great pains with the purification of our gas; indeed, I think we have been better than the London Companies in this respect. Our shares are not bought up by the Corporation, and the Corporation's shares are not bought up by us, and our accounts are examined by the Corporation Auditor. I consider the price of 4s. 6d. per 1000 cubic feet asked for ought to be obtained from the Committee; otherwise I do not see the slightest use of the Bill. We are an 8 pence cent. Company. It is true we promised in the first instance that we would give 10 pence cent. more than we now do, but I have stated that the price of gas was to be 5s. 6d. per 1000 feet; but instead of this we have supplied at 4s. 6d. per 1000 all along. The consumers obtained their gas at 1s. per 1000 below what they expected for a number of years before the Company took the step of wishing to alter their Articles. I have said that the Corporation obtained their Bill at 5s. 6d. for two years, when it was reduced to 5s. 4d., and afterwards it remained at 5s. The Londonderry Company in 1877 obtained their Bill with 5s. 9d. per 1000. The Waterford Company in the same year were allowed 5s. 9d., with 15 pence cent. off. The Limerick Company in 1878 obtained 5s. with 15 pence cent. off. The Cork Company in 1879 obtained 5s. 6d. with 15 pence cent. off. I am not going into instances where a company is small, or where there are any circumstances which would militate against an estimate, or else I might show a much higher price—it would be 7s. 6d. The 14-candle gas were raised to an illuminating power of 16 candles, it would cost 1s. 6d. outside, and 1s. 6d. inside. I do not think I should prefer to give a little higher price and have a little better gas.

Cross-examined by Mr. CLIFFORD: Unless the sliding scale applies to the Companies I have quoted, the prices I have mentioned are the maximum prices; but I contend that 4s. 6d. per 1000 is our maximum price, although we have the sliding scale, inasmuch as if we increase the price of this sum we shall suffer in our dividends. I do not know the actual price at present charged for gas in Dublin, but it may be 8s. 11d. per 1000; and

this only shows the necessity of some margin being allowed to us. Companies lower their price when they can do so, in order to meet their exigencies when coals and other things are high. I am aware that the quality of the gas in Dublin is 16 candles.

Mr. Clifford: Two candles difference in illuminating power is equal to a difference of 3s. or 3½d. per 1000, is it not?

Witness: It may be somewhere about 3d., I think.

That is a difference of 3½d. as regards Dublin compared with Cork in the price charged?—Yes; but the consumption in Dublin is about six times as much.

Cross-examination continued: The charge we propose to make for meters will add very little to our revenue. It will only apply in cases where there is scarcely any consumption. We say it is unfair to the general body of consumers that we should supply a meter to a gentleman who may perhaps use 100 ft. of gas. In fact, there are cases where the amount received for the gas is not equal to the cost of the meter to us, and in those cases we want a small increase. In my estimate of 4s. 6d. per 1000 I have made no allowance for contingencies, nor for a reserve-fund.

Mr. Clifford: You would be very much surprised, no doubt, at the statement of competent witnesses who say that 3s. 6d. per 1000 might be the cost?

Witness: I am not at all surprised at the statement, considering the quarter from whence it comes. I am a manufacturer of gas, and know the cost of it too well to believe any statement of that kind.

Cross-examination continued: I have dissuaded the Company from using Welsh coal, but I can obtain it at 3s. per ton lower than Newcastle. As an individual, I prefer Newcastle coal, but I do not say the Cork Company are not to use Welsh coal, because hundreds of companies do so. I have used it in Waterford, but discarded it there because it did not suit us so well. There are many nail-makers in Waterford, and they have a great deal of coke, which is cheap and hard. The coke from Welsh coal is not so clean and hard as the Newcastle coke, and this is one reason for our adopting the latter coal. The practice in Queenstown is much the same as at Waterford, and so it is in nearly all my works.

By Mr. MICHAEL: The Queenstown Company reduced their price to 5s. 6d. on my advice, about three months ago. Their maximum is 6s. 6d. per 1000, so they are 1s. below the price.

Cross-examination resumed: The dividend at Waterford is 8 per cent. I should say the produce of gas from Welsh coal varies from 6000 to 7000 cubic feet per ton, if it can be obtained good, and from Newcastle coal 8000 to 11,000 cubic feet per ton, if it is of good quality. I know what the London Companies say they obtain, but they use a proportion of cannel coal, although I do not know exactly the quantity. In London they are drawing their coal from week to week the whole year through, and any one who has anything about gas-making knows that if the coal was a couple of months out of the water, it is greatly deteriorated. In the case of Cork the coal is sometimes three months at sea before it is delivered. We have to lay in a large quantity every October, to last a considerable time, for fear of not getting vessels, so that our coal is sometimes in the stores for six months, and is depreciated, perhaps, 500 feet of gas per ton. We have to deliver to the public the best quality of gas we can get; but in London—as in the case of The Gaslight and Coke Company—the coal is brought from the vessel direct, and put before the retort in one operation, which does not cost above one-third, I suppose, what it does in Cork.

By Mr. Clifford: Are you aware that the London Companies must keep a store of six weeks supply?

Witness: That is a very small quantity—we have to keep six months supply. But the London Companies do not do this, whatever may be the regulations; and on this point I speak from personal knowledge.

Cross-examination continued: The quality of gas manufactured in London is not better than that made in Cork. They have, however, a better burner in London, which gives a light equal to one or two additional candles.

By Mr. MICHAEL: With regard to the leakage in London and other places, the statement made by Mr. Stevenson is so absurd that a practical man pays no attention to them. Sometimes £4000 worth of gas is sold from a mile of mains in London, while you may have a dozen miles of main before you receive that amount in Cork. The quantity of leakage depends upon the main. If we were sending four times as much gas as we are getting now through a mile of mains, our leakage would be reduced to about 5 per cent. It is a question of business, not of percentage of leakage, is it not?

Cross-examination resumed: It is unlikely our leakage can be reduced below 15 per cent., because circumstances are very much against us. The sewers are within 9 or 3 feet of the surface of the roads, and it is difficult to get the escapes out of the gas. In London the sewers are 20 feet below the carriage-way, and the gas soon comes to the surface, so that the escapes are easily found. We generally lay our pipes in the summer or autumn, but sometimes we have had to lay them in the winter, when anything sudden has come upon us. In the spring we have a consultation with the Manager, and ascertain how he stands with respect to mains, and how the pressure is, and where there is leakage, and we look at the maps, and then perhaps, on an enlargement in a certain district. The matter is then brought before the Board, and the pipes are ordered and we receive them as soon as possible afterwards. Speaking from a Shareholder's point of view, I should like to receive a dividend of 10 per cent., as proposed by this Bill, but I do not think it is possible to do so, because of the leakage. I think we should do, at least, 10 per cent. I consider we are entitled to 10 per cent. There is no company I know of that has been so successful in its operations as the Cork Company, or that has been so well conducted, or has carried out its obligations to the consumer—and more than its obligations—in a better way.

Mr. Clifford: The obligation to the consumer was to divide no more than 8 per cent.?

Witness: And we have never done so; but I should like to see that obligation removed.

Examining you, we do not obtain your Act, you will not be able to divide more than 8 per cent., and when the limit of your reserve-fund is reached, the public will obtain the benefit of a reduced price?—That will depend upon whether things remain as they are, or whether they increase in value. If coal goes up in price—which it is doing at the present time—it is not likely there will be any reduction.

Is it not a fact that you are now laying by to the reserve-fund at the rate of £1000 or £1600 a year?—I am prepared to say we ought to put by a great deal more than that.

What is the limit to your reserve-fund?—That is another question. I consider a large sum, but I do not know what it is, small or large.

I wish you would answer my question?—We give the meters free, and we ought to receive £10,000 from them.

I am not on the subject of meters now?—You are upon the subject of laying by money, and I tell you we ought to lay by more than we are doing.

If you lay by more than you are doing, the instant you reach the limit of that reserve-fund the consumers will benefit in Cork by reduced charges?—Yes, no doubt, if everything remains the same.

Mr. MICHAEL (in re-examination): The Corporation passed resolutions approving of the system of the sliding scale?

Witness: I must go farther than that. I was perhaps one of the first who was spoken to on this matter, and the inducement held out to me by the Corporation was that the Corporation was to give me to retain more than 8 per cent., and that we were entitled to it if we reduced the rate to 8 per cent.

Mr. YOUNG: I wish to ask only one question. Do you say that in every case when consumers have complained of the fittings being defective, you send men to repair them?

Witness: It is putting it very strongly, when you say in every case; but we keep a staff of officers—which are not kept in London—for repairing anything that is wrong. A consumer may perhaps begin with 5 or 10 lights, and go up to 20, 30, or even 40 lights, but he does not have the pipes inside his house increased in proportion; and in such case we send and tell him we cannot do anything unless he has his pipes increased, because the gas will not get to the burner. With the exception of cases of this kind, every endeavour is made to see that the consumers have the opportunity of burning as much gas as possible, because we know this will be to our advantage.

Mr. William Francis Cotton, examined by Mr. MICHAEL.

I have been Manager and Secretary of the Alliance and Dublin Consumers Gas Company for seven years, and have had large experience in the manufacture and supply of gas. Our Company supply the city of Dublin, five townships outside, and one outlying district. I am acquainted with the Cork Gas Works, and acted for the Corporation of Cork in the management of the Corporation's system of public lighting. In 1869 I laid down the present system of public lighting for the Corporation, and consider the Directors of the Gas Company acted very liberally to the Corporation on that occasion. The gas-works are well constructed, even as regards the old portions which were erected by the United General Gas Company. The old portions were used for the purpose of burning 10,000 feet of gas per ton, it would cost them from 3s. to 4s. per ton more than they are now paying, and therefore one effect would neutralize the other. In Dublin we used 11,000 tons of coal last year. We charge 4s. 3d. per 1000 feet inside the city, and 4s. 6d. outside, running up to 5s., and also meter-rent. The maximum is 5s., so that our price can be increased in case of a rise in the price of coal. The price of coal varies from 10s. to 12s. per ton, with a mixture of cannel, paid by the Dublin Company in 1873 was 12s. 10d. per ton; 1874, 28s. 3d.; 1875, 24s. 6d.; 1876, 21s. 2½d.; 1877, 19s. 10d.; 1878, 19s. 3½d.; and 1879, 18s. 3½d. The last two years have been exceptional, owing to the low railway freight. During the past twelve months we have had vessels come to Dublin and Queenstown for 5s. or 7s. per ton, while about four years since we paid as much as 11s. I do not think these low rates of freight will continue; in fact, they have much increased during the present year. I think we are in as good a position as the Cork Gas Company for obtaining coal, with the exception that their freights are lower than ours, and that they have a better system of production, based upon a yield of 10,000 cubic feet of gas per ton from Newcastle coal, and it works out to 4s. 2d. without any allowance for depreciation or for reserve and insurance funds, all of which are essential to the good working of gas companies. I consider a gas company ought to be a public utility, and the dividend the dividend they are entitled to divide among their shareholders, and that it is not properly conducted unless the works are kept in such a condition. I agree that all sums for replacement to exactly the same condition of things ought to be furnished by revenue, and that all new works for extensions and so on should be charged to capital. It would be an advantage the consumers if the Cork Company were to obtain a large dividend under the provisions of this Bill, because in that case there must be a corresponding reduction in the price of gas. The proportion per ton of coals and per 1000 feet of gas is very moderate compared with other provincial gas companies. Even compared with The Gaslight and Coke Company, the capital per ton of coal carbonized is 47 5s. 5d., while in the case of the Cork Gas Company it is £8 16s. 9d. Considering the district, I do not think the amount of unaccounted-for gas to be excessive. We have a district outside Dublin—called the Kingstown district—where we have made great efforts to reduce the unaccounted-for gas, and up to the present time we have not succeeded in bringing it down below 18 per cent. I consider 18 per cent. to be very fair for Cork. At Kingstown the circumstances are similar to those in Cork as regards elevation. It is absurd to make a comparison between the large Companies in London and a small Company like that at Cork; in fact, I do not think there is more in London than in Cork as regards the leakage looking after the mains and services, that they have in Cork. I do not think there would have been any saving to the consumers if the Company had adopted the more expensive plan of making a greater quantity of gas from the coals, because, owing to the low price, the one balance the other.

I agree with Mr. Anderson that the working expenses of the Cork Gas Company are not enormous, as compared with the London Companies. With the sliding scale, if the price of coal increases, or another coal famine occurs, the Cork Shareholders will have to be content with a diminished amount of dividend. With respect to the clause proposed to be added to the Act, giving the public the right to make a survey of fittings, &c., I think it is to the interest of the consumers that the Company should have that power. Last season the Dublin Company obtained authority to do similar work, and up to the present time we have supplied a large number of cooking and heating apparatus, which, of course, has increased the value of the property of the public. In Dublin 52 gas-engines in use, and a large number of cooking apparatus.

Cross-examined by Mr. Clifford: We propose to reduce the price of gas in Dublin City next September to 3s. 11d. per 1000 feet, but in the outlying townships the price will vary from 4s. 1d. to 5s. per 1000 feet. We do not supply gas in Dublin; we supply it in the outlying townships. We cannot sell coke in Dublin, unless it is of the very best quality, and we are therefore obliged to use Newcastle coal. I am aware that the Cork Company have a portion of unissued capital—about £16,000, I believe. I think it wise for a company, when applying to Parliament, to ask for powers to raise additional capital in order that they may not have to make a further application for several years. In the present case capital will be required for starting the new business—supplying cooking and heating apparatus—and extensions are always going on for which new capital is necessary.

Mr. Clifford: What do you think of this opinion expressed by Mr. Stevenson?—The answer is, starting that I think I may venture to say there is scarcely a company in the United Kingdom making such bad work as the Cork Gas Company?

Witness: I think Mr. Stevenson left out a good many items which he might and which he should have included.

Cross-examined by Mr. Clifford: I think the consumption of gas in Cork increases at the rate of about 6 or 7 per cent. per annum, which works out to about £700 or £800 a year.

Mr. Clifford: With an increased consumption, the proportionate cost of working charges is reduced. Does not that point to a state of things, which would allow the Cork Company to give a considerable sum to the shareholders?—I mean assuming things to remain as at present?

Witness: Yes; of course it would.

And meanwhile, assuming they remain as at present, the dividend of

or that, if he had, he took possession of it at the request of the Chairman of the Company, and afterwards returned it. The defendant was connected with the old Company, of which the present Company became the successors, the latter having been formed to purchase the works from the defendant, who had bought them. He was for a time a member of the Board of Directors of the new Company, and, being somewhat in question in dispute about shares, he asked to be allowed to take the register that he might examine it with the view of clearing the matter up. The Board, by resolution, decided to allow him to take away the register, and they had not since regained possession of it.

For the defence, it was contended that no actual loss could have been sustained by the detention of the book for as limited companies are required to deposit a copy of their registers of shareholders in London, it would have been easy at any time to secure, by a small payment, a copy of the register.

Defendant, on being called, said he remembered that Mr. Casey, the Managing Director of the Company, wanted to take the book home and that he (defendant) carried it for Mr. Casey to the station, where he gave it to him. He had not seen it since, while Mr. Casey had since died.

The other two witnesses examined included a son of Mr. Casey, who said that on one occasion he had seen in his father's house a book which answered the description of the register, but he had not since been able to find it.

The Jury returned a verdict for the plaintiffs, assessing the value of the book at £5, and the damages for its detention at 10s. 6d.

Justice BOWEN gave judgment for the plaintiffs for £5 10s. 6d. to be reduced to 10s. 6d. if the book were returned.

Miscellaneous News.

LEEDS CORPORATION GAS SUPPLY.

PROPOSED FURTHER LARGE REDUCTION IN PRICE.

A Special Meeting of the Gas Committee of the Leeds Corporation was held on the Monday last week—Alderman BOWER in the chair—to consider the estimate for the year ending on July 31, 1881. It was found that if the price of gas were reduced from 3s. 3d. per 1000 cubic feet—the present rate—to 1s. 10d., there would still be a balance of profit amounting to £5503.

After a long discussion, it was proposed by Mr. SCARR that the estimate be accepted, and that the Committee recommend the Council to reduce the price to 1s. 10d. per 1000 feet from the 1st of July.

Mr. SPARK moved as an amendment that instead of reducing the price of gas, the profit shown in the estimate should be applied in reducing the sulphur impurities to a maximum of 20 grains per 1000 cubic feet of gas, and abolishing meter-rents. Advocating the abolition of meter-rents, he pointed out that they pressed unfairly upon the smaller consumers, who represented about half the consumers in the borough, and who were charged at the rate of £3 per 100,000 cubic feet of gas used, whilst the larger consumers paid only 15s.

Several members of the Committee advocated the additional purifying of the gas, but the proposal to abolish meter-rents did not meet with approval, and on a vote being taken the amendment was lost.

Mr. CARTER then proposed that the price of gas should be reduced from 3s. 3d. to 2s. per 1000 feet, and that the gas be purified to a maximum of 20 grains of sulphur per 1000 cubic feet.

After some discussion, it was agreed to divide the proposition; and, on a vote, that part relating to the price was lost, and the original motion that the price be reduced to 1s. 10d. adopted.

It was afterwards resolved that instructions be given to the Gas Engineer (Mr. Henry Woodall) to take steps for reducing the sulphur impurities in the gas to a maximum of 20 grains per 1000 cubic feet.

In a letter to the *Leeds Mercury* the following day, Mr. Spark, referring to the unequal incidence of the charges for meters, as mentioned by him above, said: "Perhaps the anomaly will be better understood if put in another way. There are 6200 of the poorest part of our population who pay an average of 8s. per year for gas and meter-rent—viz., 2500 feet of gas at 2s. 3d. per 1000 feet, 6s.; meter-rent, 3s.; total, 9s. For every 1000 feet of gas, therefore, which these people consume, they are called upon to pay no less than 3s. 6d. In other words, 6200 gas consumers in Leeds pay a total per year of £2484, of which £1554 is for gas, and no less than £930 for measuring the same! Now as 3d. per 1000 feet on the total sale of the world must be met, the full sum realized from meter-rent, it follows that a part of the gas consumers in Leeds are contributing 1s. 0½d. each, or £320 per year, for the benefit of the larger consumers."

METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS.

At the Meeting of the Board last Friday the following report of the Parliamentary Committee was adopted: "Your Committee have to report with reference to the Bill promoted by the Corporation of London relative to the testing of gas in the Metropolis, and the forfeitures to be incurred by the Companies for defective gas, that the Bill having been settled by the Board of Trade with the consent of all the parties, and having passed the House of Commons, is now before the House of Lords, and that a petition has been presented against it by The Gaslight and Coke Company. As, if this petition be maintained, there may be some risk of an alteration of the Bill which would be contrary to the views of the Board, your Committee think it desirable that a petition should be at once presented, asking that no alterations may be made, and they may recommend that the Chairman be authorized to seal a petition to that effect, and that the Solicitor be authorized, if he should find it necessary, to instruct counsel to appear in support of the petition. Your Committee wish, if possible, to avoid the expense of instructing counsel, and they have directed a letter to be written to the Board of Trade asking that department to give an assurance that the Bill, if opposed, should not be allowed to proceed."

(The petition above referred to has since been withdrawn.)

A joint report by the Board's Engineer and Consulting Chemist as to the recent explosion of gas in the neighbourhood of Tottenham Court Road—the full text of which will be found in another column—was also presented, and a copy of it was ordered to be sent to each of the Gas Companies in the Metropolis.

THE CHESTER UNITED GAS COMPANY'S ACCOUNTS.

From a report presented to the Chester Town Council by Mr. J. E. Edmonds, the City Treasurer, and Chairman of the Board of Directors of the local Gas Company, it appears that the receipts of the Company increased during the period from 1869 to 1878 from £16,301 19s. 6d. to £21,416 2s. 11d., and the expenditure from £9965 4s. 4d. to £14,104 3s. 5½d.; the net increase of profits being £978 3s. 7d. During the years 1875 to 1878 the Company had been paying the maximum amount of dividend allowed by their Act of Parliament in addition to laying aside £3491 10s. 10d. for a reserve-fund, for the purpose of equalizing dividends. This fund

now stands at £4467 0s. 10d. The charge made to the public for gas was as follows:—

1871-72	4s. 0d. per 1000 feet.
1873-75	4 6 "
1876	4 3 "
1877	4 3 "
1878	3 9 "
The capital expended to the date of the Company obtaining their last Act of Parliament was	
Since that date it has been as follows:—	
1870	£5,840 16 3
1871	2,194 0 0
1872	158 15 2
1873	942 12 5
1874	266 15 6
1875	138 12 2
1876	188 0 0
1877	1,580 10 0
1878	872 3 11
11,683 10 7	
Total capital expended to Dec. 31, 1878	
£59,474 11 2	

The particulars of this additional expenditure are as follows:—

Cost of Act of Parliament	£493 7 10
Land acquired	3,540 15 4
New buildings	203 15 10
New mains	7,445 11 7
£11,683 10 7	

The capital authorized to be raised by the Company's last Act of Parliament was £20,000, with power of mortgage for £5000, and of this there has been raised £16,500, leaving £3500 to be raised. The analysis of the capital so raised by the Company stands as follows:—

Consolidated ordinary stock on which 10 per cent. per annum may be paid	£30,000
Consolidated 7 per cent. preference stock	30,000
Ordinary new shares, 7 per cent.	14,000
Mortgages and bonds	17,500
Total	£91,500

The difference in the expenditure arose chiefly from two causes—from increased cost of labour and from the repairs to mains.

In concluding his report, the City Engineer said: "I cannot but express an opinion that any present positive advantage which can be got from the Company in passing their proposed new Act will be found much more beneficial to the Town Council and the public generally than any supposed future gain to be derived from the careful watching of the manipulation in the works for the purpose of increasing revenue and capital. The fact that the Company have been able of late years not only to pay the maximum dividends, but to accumulate a good reserve-fund, and this upon an unusually large capital, whilst it may show good management, is nevertheless a strong reason for seeking to obtain from the Company one or all of the following concessions:—1. A renewal of the power of the Council to purchase the works. 2. A reduction in the maximum charge which may be made for gas. 3. A reduction in the cost of lighting the public lamps. 4. A greater illuminating power in the gas."

THE HEREFORD CORPORATION NEW GAS-WORKS.

These works, the necessity and the site for which, it may be remembered, in 1878 caused much discussion and delay in the Hereford Town Council, are, we learn, now nearly completed; and an official visit was recently paid to them by the Mayor, the Gas Management Committee, and others specially interested in the gas supply of the city, for the purpose of inspecting one of the finished gasholders and tanks, and the house for the Manager (Mr. W. Davis), which is almost ready for occupation.

The party first visited some cottages adjoining the works where certain additions are being made, after which they proceeded to the retort-house. The condensers were then examined, and subsequently an ascent was made to the tops of the scrubbers. After a look in at the boiler-house, where the excellent machinery came in for its share of admiration, the gasholder-tanks were visited. One tank, as stated above, is already fitted with a holder, but the other tank is at present unoccupied, although the excavation for it is completed, as well as the masonry which lines the interior. The purifier-house, to which is attached a large revivifying-shed for the oxide, was then looked over. This purifier-house was originally the foundry of the old Waggon Works, and the roof has been raised to provide the necessary room. The purifiers, with the travelling cranes above them for lifting the lids, and a revolving shoot for filling the boxes, were examined, as was also the whole of the apparatus, and a move was then made to the station-meter and governor house. The last place visited was the Manager's new house, which is situated on the right-hand side of the main entrance to the works. This building is substantial, commodious, and, at the same time, pleasing to the eye. Like the rest of the buildings, it is composed of red brick, relieved by two strings of ornamental bricks, and several courses of blue bricks. The interior comprises drawing-room, business-room, kitchen, scullery, pantry, wash-house, &c.; and on the ground floor, and in the first floor, there are two large bed-rooms, three smaller rooms, bath-room, &c.

Having inspected the house, the party were invited by the Mayor to luncheon, he occupying the chair, and Mr. Davis, by his request, the vice-chair. Luncheon over, a few congratulatory speeches were made.

Mr. Harris, in response to the toast of "Success to the Hereford New Gas Works," said he thought the Gas Management Committee had every reason to be satisfied with the progress made in the works, and with the very able way in which these works had been carried out by their Engineer. He trusted that the works would be completed in a couple of months from this time they would be in a position to make gas for the new works. Mr. Davis had every hope of doing so, and he (Mr. Ralph) thought if they could only prevail on the inhabitants of Hereford to burn sufficient gas, there could be no doubt whatever that the undertaking would be successful. He asked the Mayor whether he had not long since it was since they purchased the old works, and he was told it was eight years, and that seven instalments of the purchase-money out of the thirty had been repaid. He believed the total amount borrowed was about £60,000, and it was to be repaid in thirty equal instalments of interest and capital, so that, saying they were paying at the rate of £4,200 a year principle, the city had already paid of £126,000, and he thought that the Auditor on going through the accounts said the Gas Management Committee had been able during the period of eight years to pay the whole of the interest and instalments due, and get a surplus of £6000, so according to the new works had benefited to the extent of £20,000, and really in a few more years would be sufficiently amply provided to have paid the whole cost of the new works. He could only say it was a great pity the city had not

purchased the gas-works very much earlier. Perhaps the Mayor did not quite see with him in this, and there might be some who would have been gratified if the purchase of the works had been deferred till now.

The Mayor: I think you purchased them just at the right time. Mr. RALEIGH, continuing, said he hoped the new works would go on and be as successful in the future as the old ones had been in the past. He did not think any inhabitants of the district would have any reason to be other than glad that the Corporation had become the proprietors of the gas undertaking. He concluded by proposing "The Health of the Mayor."

The Mayor responded, and in his turn proposed "The Health of Mr. Davis," who, he said, had so ably carried on the old works, and also so ably conducted the new ones, thereby keeping the inhabitants of the district, who were somewhat afraid of it at one time—viz., total darkness. He had no doubt the new works, when completed, would relieve Mr. Davis's mind of a great deal of anxiety, and he trusted that their Manager would be spared for many years to conduct the works which he had so far carried out so successfully towards completion.

Mr. Davis, in returning thanks, said that on the previous occasion of their meeting at the works he had stated that it was his ambition to erect for the city new works within the estimate that had been prepared, and capable of supplying quite up to the quantity of gas proposed. Although they were some a little over the expenditure that was originally intended, having provided a second gasholder-tank and some additional scrubbing power and other things, they had not really exceeded the first estimate, if deductions were made for the extras which were, as a fact, not included in it. The second tank was completed, and the first tank had the holder added to it, and was now nearly ready for use. He had every confidence that it would prove satisfactory both in the working and as to the cost. He saw a letter in one of the papers the previous week relative to the explosions which had taken place in London and at Bilston, in which the writer wished for some statement from himself as to the condition of the new mains which had been laid down in Harewood.

Mr. RALEIGH said that on the Tuesday previous to the recent explosion in London he reported that he had completed the laying down of the new mains, and that they were being charged with gas. The question was asked when he should make the connection, and this led to the explanation of the danger of making connections in new mains until such time as the water had been cleared from the pipes, and they were fully charged with gas so that there should be no explosive compound in them. He then explained the precautions he had taken. In the first place, after making everything secure, the pipes were tested by means of a small pair of bellows and a pressure-gauge, and under this test they remained perfectly tight. Then a half-inch gauge, under a half-inch head of water, the gauge being quite stationary. The next thing was to get the air out and the gas in. The highest point of the city was in Broad Street, and he there made a temporary connection with the old pipes, thereby supplying gas from the old pipes to the new at the highest point and taking point for air out at the lowest point for all practical purposes—at the back of the station near the works. After letting it blow out there through a pipe, which was sufficiently high to prevent any one from interfering or tampering with it, or applying a light to it, he tested it from time to time until he procured a mixture which was not explosive. He said that he had procured a mixture which was not explosive, and he had no doubt that he had no doubt it would be successfully done. He concluded by again thanking them for the compliment they had paid him in drinking his health.

The party shortly after this broke up.

ARBROATH GAS CORPORATION.

At the Meeting of the Arbroath Gas Corporation, Monday, the 12th ult.—Provost RIM in the chair—a balance-sheet of the undertaking (referred to farther on) for the year ended May 30 was laid on the table. It showed a surplus profit on the year's working of £761 8s. 8d., as against £740 7s. 6d. the previous year. The Gas Committee recommended that the price of gas for the current year, from 1st of Jan. 21d. per 1000 feet, the same as last year, with a rebate of 21d., making the price to be 5s. per 1000 feet. The Committee also recommended that one-half of the surplus profits should be paid as usual to the Town Council, for public improvements.

Provost RIM said he considered the balance-sheet was very satisfactory, and it would be for the Board to say whether the price of gas as recommended by the Committee should be approved of.

Baillie THORNTON thought the Board had reason to be well satisfied with the balance on the accounts; but, so far as he could learn, the price of gas in Arbroath was a great deal higher than it was in surrounding towns, and he did not know but that the Board might this year to reduce the price of gas to 5s. per 1000 feet, with a rebate of 21d.

Mr. THORNTON moved the approval of the Committee's report. They had, he said, been many times at the works, and were perfectly satisfied that the old price would require to be adhered to. They had no idea what might occur at the works; they must be prepared for any accident, or an increase in the price of coal.

Baillie KEITH seconded the motion.

Mr. BROWN said since the Gas Act was passed in 1871, there had been paid to the town for public improvements £2728, which was an indirect tax; while £2928 had been paid in direct taxes, which was a direct tax; together, £4794. He then quoted the prices charged for gas in neighbouring towns, for the purpose of showing that the charge in Arbroath was too high.

Mr. THORNTON moved that it be fixed at 5s. He said he did not see anything to hinder them reducing the price of gas. He said he did not say there would be so much profit to go to the town as in former years; if they reduced the price, but he did not consider it was the best way of taxation to charge the gas consumers for public improvements. They thought they should keep the margin as possible.

Mr. CARROLL seconded Baillie THORNTON's motion in principle he thought that gas-making should be as much as possible carried itself, and he did not think it was fair to tax the community for public improvements through their gas-meters. There were shopkeepers who were most unduly taxed, and he thought that the light from what their Manager (Mr. Terrace) had stated as the estimate for the income tax, that they would be perfectly safe in fixing the price of gas at 5s. per 1000 feet.

Mr. HERALD, however, thought the Board should agree to the recommendation of the Committee.

Mr. SAMPSON said he had seen reason to change from the view he had held in committee, which was in favour of their reducing the price of gas.

Mr. DRICKSON thought the safe course was to adopt the Committee's report. He did not think it was fair to go too near the margin. They would soon have to double the amount now put into the sinking-fund, and it was desirable to keep it clear as possible.

On a vote being taken, the report was adopted by ten votes to four.

From the annual report of the Manager (Mr. David Terrace) we learn that the quantity of coals used during the year ending May 30 was 3569 tons, as against 3808 tons in 1878-79, being an increase of 251 tons, or 71 per cent. The make of gas was 37,697,000 cubic feet, which was 21

millions more than the previous year, or an increase of 71 per cent.; but when compared with the year 1877-78, the increase was 41 per cent. The make of gas per ton of coal carbonized was 15,091 feet, while the gas sold per ton was 9345 feet, or about the same quantity as in the previous year. The unaccounted-for gas for the year 1878-79 was 12.13 per cent. of the quantity made; last year it was 12.76, which is equal to a reduction of 0.37 per cent., or 34 feet more sold per ton of coal used. The number of consumers for the year ending May, 1879, was 5293; for the past year the number was 5227, or an increase of 21.

The balance-sheet shows that there was received from sales of gas in the past twelve months, £5653 16s. 4d.; and for rental of meters, £277 17s. 4d., less a discount of 21d. per 1000 feet of gas sold, £346 0s. 7d.; leaving a net result of £5815 13s. 11d. The sum of £455 11s. 6d. was received for tar and cinders; and this, with the balance brought forward from the previous year and miscellaneous receipts, brought up the credit of the profit and loss account to £10,058 16s. 8d. This sum was absorbed by the outgoings to within £761 8s. 8d., as stated in the Gas Committee's report above referred to.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health on the Composition and Quality of the Metropolitan Waters in July:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic As Nitrate, &c.	Nitrogenous Organic Matter, &c.	Ammonia.	Hardness (Clark's Scale).	Before Boiling.	After Boiling.
<i> Thames Water Companies. </i>							
Grand Junction	18.75	0.125	0.005	0.005	14.3	2.7	2.7
West Middlesex	19.62	0.020	0.135	0.002	0.009	14.3	2.7
Southwark and Vauxhall	17.87	0.004	0.125	0.001	0.003	14.3	2.7
Chelsea	18.15	0.004	0.135	0.002	0.009	14.3	2.7
Lambeth	18.51	0.004	0.125	0.001	0.003	14.3	2.7
<i> Other Companies. </i>							
Kent	32.93	0.000	0.424	0.000	0.004	22.4	4.8
New River	19.22	0.004	0.137	0.000	0.005	15.0	3.8
East London	21.43	0.018	0.131	0.000	0.009	15.4	3.0

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours.

The water was found to be clear and nearly colourless, in all cases but the following, when it was slightly turbid—namely, Grand Junction.

C. MEYMOOT TIDY, M.B., &c.

METROPOLITAN BOARD OF WORKS.—At last Friday's meeting of the Board the following resolution—which, however, was not even seconded, and so fell to the ground—was proposed by Mr. Alderman Ellis, for the gratuitous supply of water to each parish in the Metropolis (formerly provided by the parish pump, at the cost of the local rates) being suppressed by law, it is reasonable that a similar gratuitous, but purer supply of water be provided for the Metropolis at the cost of a general rate.

EXETER CORPORATION WATER SUPPLY.

A Special Meeting of the Exeter Town Council was held on Thursday last—the Mayor (Alderman Ellis) in the chair—for the purpose of receiving a report from the Finance Committee, and the Treasurer's estimate of the amount required to be raised by the general district-rate for the ensuing year. The report was somewhat lengthy, and was divided into sections, the second of which, having reference to the Corporation's water undertaking, showed that the sum of £130,000 had been raised on behalf of the Exeter Corporation Water Loan, and bonds issued for that amount, but the whole of the shares and debentures of the late Water Company, it was stated, had not yet been redeemed and paid off, although this loan was so intended. Remaining unpaid was the redemption value of shares in the Company, amounting to £2825, and debentures of the value of £11,450. This sum of £13,275 had been temporarily employed in the purchase of property for street and other improvements, and would be repaid by future loans. With regard to the ordinary income and expenditure, the Treasurer reported an excess of the latter, caused partly by the payment of £1912 11s. 8d. additional interest on loans (including the water undertaking) for the sum of £13,275, and partly by the sum of £17,072 12s. 2d. from the Water Committee, out of a sum of £471 16s. 2d., which they should have provided.

The Water Committee's report showed total receipts for 1879 and 1880 of £18,555 2s. 6d.; and payments for 1879, £10,072 12s. 2d.; and 1880, £2812 15s. 11d.; making a total of £18,385 9s. 1d., and leaving a balance in hand of £369 13s. 5d. There was, however, still due to the district-fund account the sum of £2338 14s. 6d. in respect of interest, and also the sum of £8407 10s., the amount necessary to be set aside the first year towards the sinking-fund; making altogether due from the Water Committee, £4995 6d. The Water Committee's report also showed the year's expenditure, according to the following figures—Ironwork, repairs of engines and of water-wheels, £1169 4s. 8d.; cost of the Company on purchase, £296 16s. 8d.; filter-beds (first portion), £600; sum paid the Company for stock and moveable plant, £397 18s. 6d.; accumulated stock of the value of £1929 15s. 3d.; making a total of £10,072 12s. 2d.

The Corporation water accounts were also given, and show that for the year ending March 25, 1879, the payments were £10,072 12s. 2d., leaving a deficit of £583 16s. 11d. upon the receipts of the year to be carried forward. The general balance-sheet for the same year showed the assets to be £2180 9s. 2d.; while the liability account was as follows:—To balance of revenue account, £483 16s. 11d.; acknowledgments owing, £1 5s.; interest on bonds and annuities, £1003 15s. 5d.; balance, £591 2s. 10d.—total, £2180 9s. 2d. The revenue account for the year ending March 25, 1880, showed receipts, £1916 7s. 3d.; while the payments were less this amount by £399 3s. 3d. The general balance-sheet for the year ending at £3828; and the liabilities—viz., salaries and working expenses—at £699 15s. 11d.; interest due to Urban Sanitary Authority, £2336 14s. 6d.; three months interest on debentures, £116 9s. 1d.; six months annuities, £171 7s. 1d.; balance, £504 14s. 7d.—total, £3828 7s. 2d.

The report having been previously placed in the hands of the members, was taken as read; and, after discussion, adopted.

THE PROPOSED ACQUISITION OF THE STROOD WATER-WORKS BY THE ROCHESTER CORPORATION.—An extraordinary meeting of the Strood Water-Works Company was held on Wednesday, the 21st ult.—Mr. Ball in the chair—when it was unanimously decided to consent to the Bill introduced into Parliament to enable, among other measures, the Rochester Corporation to acquire the Strood Water-Works, and to the receipt of Mr. H. Wickham, Solicitor to the Corporation, was appointed Secretary, in the place of Mr. G. Rack, deceased.

THE RECENT GAS EXPLOSION NEAR TOTTENHAM COURT ROAD.

The following report on the recent gas explosion near Tottenham Court Road, by the Engineer (Mr. W. Bazalgette) and the Consulting Chemist (Mr. W. Keatinge) of the Metropolitan Board of Works, was presented at the meeting of the Board on Friday last, and a copy ordered to be forwarded to each of the London Gas Companies:—

Spring Gardens, S.W., July 23, 1880.

To the Works and General Purposes Committee.

In compliance with the order of the Board, we beg to have submitted the following report upon the circumstances attendant upon the gas explosion which occurred in a large gas-main belonging to The Gaslight and Coke Company, on the 5th inst.

It is probable that the members of the Committee have made themselves generally acquainted with the circumstances of this occurrence; but it is necessary, in order to make our report clear, that we should trouble the Committee with some details, which are perhaps already known to them, but which cannot conveniently be omitted.

The main in which the explosion took place extended from the corner of Bayley Street, Tottenham Court Road, along Percy Street, and up Charlotte Street, where it was united to an equally large main running along Howland Street, but being cut off from the Howland Street main by a valve which appears to have never been opened up to the time of the explosion. These mains were of large size—3 feet in diameter.

The section of the main along which the explosion occurred commenced with a plugged (or closed) end at Bayley Street, opposite the Bedford Head Hotel; it then crossed the Tottenham Court Road, ran along Percy Street, and thence north along Charlotte Street, to the valve in Howland Street.

The new main which was intended to be continued eastward. It appears to have been completed and kept closed, or dead, for about two months, the connection with the eastern section in Bayley Street not having been made. Preliminary to the making of this connection, the main appears to have been tested in the usual way, a $\frac{1}{2}$ -inch stand-pipe having been let into the top of the main, so that a pressure-gauge might be attached to it.

It was intended that the connection should be made on Tuesday, July 6. With this view, between six and seven o'clock on the evening of Monday, the 5th, the plug or iron flange which stopped the Bayley Street end of the main was being cut out. The foreman was standing on the main at the time, and had the stand-pipe at the top of the $\frac{1}{2}$ -inch stand-pipe. It is very important to remark that the gauge, before it was removed, had stood at zero, showing that there was no pressure in the closed main. The foreman had roughly tested the air in the main by smelling at the open end of the small stand-pipe, and, "as an additional precaution," he had inserted a small piece of paper into the end of the stand-pipe immediately by an explosion. Six other explosions followed upon this, in the course of the new main, but in one respect this was the most serious, inasmuch as it was by the effect of the first explosion that two workmen were killed.

The ground was open at this point, as it was here that the connection was to have been made between the two sections of new main. The two men who were killed were at work in the trench between the plugged end of the completed main and the open end of the unfinished portion. By the force of the explosion the iron plug was blown out with great violence, killing one man on the spot, and fatally injuring the other.

The explosion at the corner of Bayley Street was the first of the seven which ultimately occurred between this point and the valve at Howland Street.

Taking the distances of the exploded portions of the main in order from Bayley Street, the second explosion took place in Percy Street, about 215 feet from the first. At this point about 110 feet of the main, and the paved carriage-way, for a width of 10 to 12 feet, was blown up, and the footway, area walls, and various parts of the houses, Nos. 14 to 19, Percy Street, were damaged.

The third explosion was about 465 feet from the first, and was opposite Nos. 11 and 12, Percy Street, 12 feet of the main and 30 feet of the footway carriage-way were blown up at this spot; the footway and the houses Nos. 5 and 6 were damaged; some damage also was done to Nos. 7, 8, and 9, on the same side of the street, and to Nos. 32 to 35, on the opposite side of the street.

The fourth explosion was 645 feet from the first, and was opposite Nos. 3 and 5, Charlotte Street. At this place 11 or 12 feet of the main were blown up, and the road, footway, vaults, and areas were destroyed within a space of 28 feet by 24 feet, besides other damage which was done to the houses.

The fifth explosion was 955 feet from the corner of Bayley Street, and was opposite to Nos. 29 and 31, Charlotte Street at the corner of Bennett Street. An opening was made in the street at this place, the opening being 55 feet long, 10 feet wide in one part, and 23 feet wide for the remainder of the distance; the vaults being destroyed, and a good deal of other damage done to the property.

The sixth explosion was 1,105 feet from the point where the first occurred; this was opposite Nos. 103 and 105, Charlotte Street. Here 12 feet of main were blown up, and an opening 28 feet by 31 feet was made in the carriage-way; the two houses were also damaged. The local sewer also appears to have been seriously injured.

The last or seventh explosion took place at the right-angled junction of the two 3 feet mains at the point where Howland Street crosses Charlotte Street and Fitzroy Street, or about 2075 feet from the corner of Bayley Street, where the first explosion took place. The valve which at this junction cut off the charged main in Howland Street from the closed, or dead, main in Charlotte Street was also the T-piece joint which was shattered to pieces, and an opening 12 feet by 10 feet made in the carriage-way; but there appears to have been no further damage in this locality.

The circumstances which seem most worthy of note in connection with this explosion are—first, as the main by which the gas found its way into the new main from which it was supposed to be cut off by a sound and efficient valve; secondly, as the way in which seven successive explosions occurred with an interval of time between them respectively.

With regard to the first point, two theories were raised to account for the presence of sufficient gas in a new main to produce such an explosive mixture of air and gas. One of these supposed the gas to have entered the main by leakage from without; the other that the gas entered at the Howland Street end of the new main in consequence of a defect in the valve, which was situated at that point.

There seems very little probability that the gas could have entered the new main by leakage from without, and no reason seems to have been given to support that view. In our opinion there can be very little doubt that the gas found its way into the new main through the valve at Howland Street, which might by some means have been slightly injured. In that case a leakage of no great amount would be sufficient to admit enough of gas to account for the cubical contents of the gas which was mainly involved in the explosion were between 14,000 and 15,000 feet, and as it is obvious, from the circumstance that explosions occurred only in certain points in the course of the main, that the whole of the contents were not

explosive, probably less than 2000 cubic feet of gas were in the main in more or less complete admixture with the air, and it would not require a great leak in the valve for 2000 feet of gas to pass in the course of the time during which the new main had remained unused after its completion.

The Coroner's jury took the view that the gas had entered the new main in consequence of some defect in the valve at the Howland Street junction, and this appears to us to be the correct view. Unfortunately, the valve and its fittings were entirely destroyed by the last explosion, so that there were no means of making any investigation concerning the previous state of the valve; but all the circumstances of the case seem to point to the valve as the origin of the mischief, whereas there seems to be nothing to support the theory that gas found its way into the new main by leakage inwards, such gas having previously leaked out of other mains in the vicinity on many occasions.

If it be admitted, as is most probable, that the gas passed by the valve from the fully charged main in Howland Street, into the new main in Charlotte Street, the formation of an explosive or inflammable mixture of gas and air was a necessary concomitant; whether such mixture would be explosive or merely inflammable was only a question of proportion between the gas and air, and the completeness of the admixture or diffusion of the gas. If the gas were in less proportion than about 7 per cent, by volume, or more than 25 per cent., it would burn away quietly, and not explode; but if it were in the proportion of something between 7 and 25 per cent., the mixture would be explosive. What the actual proportions were in this case, a mixture of gas and air, explosive in some places but only inflammable in the great part of its course, had been formed in the new gas-main, and further it seems only reasonable to believe that the gas had entered by the valve, and not by leakage inwards, into the main, which had been previously so thoroughly sound and tested, and that a quantity of air, which had been kept on from Thursday, the 1st, until Sunday, the 4th of July.

With respect to the second point for consideration, it is very interesting to observe that a number of distinct explosions took place in regular order, and with a clear interval of time between them. It seems, at first sight, that the most reasonable explanation of this is that there have been the case, as it might have been expected that the gas would have diffused itself into the air contained in the main during the considerable time that had elapsed after the main was finished up to the plugged end, and that an uniform mixture would have been formed, either simply inflammable or explosive, and that the explosion of the mixture would then it might have been expected that one general explosion of the whole of the contents of the main would have taken place at one moment, the iron pipe probably giving way in any spot in which it was weakest, or in which the pressure of the earth above and about it happened to be greatest. The fact, however, that the explosions took place at points so far apart along the top of the stand-pipe in the end of the main at Bayley Street, an immediate explosion followed, the effect of which extended only to that particular spot; after an appreciable time had elapsed, a second explosion occurred in the course of the pipe; then another, and another, at distances of 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1,000, 1,050, 1,100, 1,150, 1,200, 1,250, 1,300, 1,350, 1,400, 1,450, 1,500, 1,550, 1,600, 1,650, 1,700, 1,750, 1,800, 1,850, 1,900, 1,950, 2,000, 2,050, 2,100, 2,150, 2,200, 2,250, 2,300, 2,350, 2,400, 2,450, 2,500, 2,550, 2,600, 2,650, 2,700, 2,750, 2,800, 2,850, 2,900, 2,950, 3,000, 3,050, 3,100, 3,150, 3,200, 3,250, 3,300, 3,350, 3,400, 3,450, 3,500, 3,550, 3,600, 3,650, 3,700, 3,750, 3,800, 3,850, 3,900, 3,950, 4,000, 4,050, 4,100, 4,150, 4,200, 4,250, 4,300, 4,350, 4,400, 4,450, 4,500, 4,550, 4,600, 4,650, 4,700, 4,750, 4,800, 4,850, 4,900, 4,950, 5,000, 5,050, 5,100, 5,150, 5,200, 5,250, 5,300, 5,350, 5,400, 5,450, 5,500, 5,550, 5,600, 5,650, 5,700, 5,750, 5,800, 5,850, 5,900, 5,950, 6,000, 6,050, 6,100, 6,150, 6,200, 6,250, 6,300, 6,350, 6,400, 6,450, 6,500, 6,550, 6,600, 6,650, 6,700, 6,750, 6,800, 6,850, 6,900, 6,950, 7,000, 7,050, 7,100, 7,150, 7,200, 7,250, 7,300, 7,350, 7,400, 7,450, 7,500, 7,550, 7,600, 7,650, 7,700, 7,750, 7,800, 7,850, 7,900, 7,950, 8,000, 8,050, 8,100, 8,150, 8,200, 8,250, 8,300, 8,350, 8,400, 8,450, 8,500, 8,550, 8,600, 8,650, 8,700, 8,750, 8,800, 8,850, 8,900, 8,950, 9,000, 9,050, 9,100, 9,150, 9,200, 9,250, 9,300, 9,350, 9,400, 9,450, 9,500, 9,550, 9,600, 9,650, 9,700, 9,750, 9,800, 9,850, 9,900, 9,950, 10,000, 10,050, 10,100, 10,150, 10,200, 10,250, 10,300, 10,350, 10,400, 10,450, 10,500, 10,550, 10,600, 10,650, 10,700, 10,750, 10,800, 10,850, 10,900, 10,950, 11,000, 11,050, 11,100, 11,150, 11,200, 11,250, 11,300, 11,350, 11,400, 11,450, 11,500, 11,550, 11,600, 11,650, 11,700, 11,750, 11,800, 11,850, 11,900, 11,950, 12,000, 12,050, 12,100, 12,150, 12,200, 12,250, 12,300, 12,350, 12,400, 12,450, 12,500, 12,550, 12,600, 12,650, 12,700, 12,750, 12,800, 12,850, 12,900, 12,950, 13,000, 13,050, 13,100, 13,150, 13,200, 13,250, 13,300, 13,350, 13,400, 13,450, 13,500, 13,550, 13,600, 13,650, 13,700, 13,750, 13,800, 13,850, 13,900, 13,950, 14,000, 14,050, 14,100, 14,150, 14,200, 14,250, 14,300, 14,350, 14,400, 14,450, 14,500, 14,550, 14,600, 14,650, 14,700, 14,750, 14,800, 14,850, 14,900, 14,950, 15,000, 15,050, 15,100, 15,150, 15,200, 15,250, 15,300, 15,350, 15,400, 15,450, 15,500, 15,550, 15,600, 15,650, 15,700, 15,750, 15,800, 15,850, 15,900, 15,950, 16,000, 16,050, 16,100, 16,150, 16,200, 16,250, 16,300, 16,350, 16,400, 16,450, 16,500, 16,550, 16,600, 16,650, 16,700, 16,750, 16,800, 16,850, 16,900, 16,950, 17,000, 17,050, 17,100, 17,150, 17,200, 17,250, 17,300, 17,350, 17,400, 17,450, 17,500, 17,550, 17,600, 17,650, 17,700, 17,750, 17,800, 17,850, 17,900, 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24,200, 24,250, 24,300, 24,350, 24,400, 24,450, 24,500, 24,550, 24,600, 24,650, 24,700, 24,750, 24,800, 24,850, 24,900, 24,950, 25,000, 25,050, 25,100, 25,150, 25,200, 25,250, 25,300, 25,350, 25,400, 25,450, 25,500, 25,550, 25,600, 25,650, 25,700, 25,750, 25,800, 25,850, 25,900, 25,950, 26,000, 26,050, 26,100, 26,150, 26,200, 26,250, 26,300, 26,350, 26,400, 26,450, 26,500, 26,550, 26,600, 26,650, 26,700, 26,750, 26,800, 26,850, 26,900, 26,950, 27,000, 27,050, 27,100, 27,150, 27,200, 27,250, 27,300, 27,350, 27,400, 27,450, 27,500, 27,550, 27,600, 27,650, 27,700, 27,750, 27,800, 27,850, 27,900, 27,950, 28,000, 28,050, 28,100, 28,150, 28,200, 28,250, 28,300, 28,350, 28,400, 28,450, 28,500, 28,550, 28,600, 28,650, 28,700, 28,750, 28,800, 28,850, 28,900, 28,950, 29,000, 29,050, 29,100, 29,150, 29,200, 29,250, 29,300, 29,350, 29,400, 29,450, 29,500, 29,550, 29,600, 29,650, 29,700, 29,750, 29,800, 29,850, 29,900, 29,950, 30,000, 30,050, 30,100, 30,150, 30,200, 30,250, 30,300, 30,350, 30,400, 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36,700, 36,750, 36,800, 36,850, 36,900, 36,950, 37,000, 37,050, 37,100, 37,150, 37,200, 37,250, 37,300, 37,350, 37,400, 37,450, 37,500, 37,550, 37,600, 37,650, 37,700, 37,750, 37,800, 37,850, 37,900, 37,950, 38,000, 38,050, 38,100, 38,150, 38,200, 38,250, 38,300, 38,350, 38,400, 38,450, 38,500, 38,550, 38,600, 38,650, 38,700, 38,750, 38,800, 38,850, 38,900, 38,950, 39,000, 39,050, 39,100, 39,150, 39,200, 39,250, 39,300, 39,350, 39,400, 39,450, 39,500, 39,550, 39,600, 39,650, 39,700, 39,750, 39,800, 39,850, 39,900, 39,950, 40,000, 40,050, 40,100, 40,150, 40,200, 40,250, 40,300, 40,350, 40,400, 40,450, 40,500, 40,550, 40,600, 40,650, 40,700, 40,750, 40,800, 40,850, 40,900, 40,950, 41,000, 41,050, 41,100, 41,150, 41,200, 41,250, 41,300, 41,350, 41,400, 41,450, 41,500, 41,550, 41,600, 41,650, 41,700, 41,750, 41,800, 41,850, 41,900, 41,950, 42,000, 42,050, 42,100, 42,150, 42,200, 42,250, 42,300, 42,350, 42,400, 42,450, 42,500, 42,550, 42,600, 42,650, 42,700, 42,750, 42,800, 42,850, 42,900, 42,950, 43,000, 43,050, 43,100, 43,150, 43,200, 43,250, 43,300, 43,350, 43,400, 43,450, 43,500, 43,550, 43,600, 43,650, 43,700, 43,750, 43,800, 43,850, 43,900, 43,950, 44,000, 44,050, 44,100, 44,150, 44,200, 44,250, 44,300, 44,350, 44,400, 44,450, 44,500, 44,550, 44,600, 44,650, 44,700, 44,750, 44,800, 44,850, 44,900, 44,950, 45,000, 45,050, 45,100, 45,150, 45,200, 45,250, 45,300, 45,350, 45,400, 45,450, 45,500, 45,550, 45,600, 45,650, 45,700, 45,750, 45,800, 45,850, 45,900, 45,950, 46,000, 46,050, 46,100, 46,150, 46,200, 46,250, 46,300, 46,350, 46,400, 46,450, 46,500, 46,550, 46,600, 46,650, 46,700, 46,750, 46,800, 46,850, 46,900, 46,950, 47,000, 47,050, 47,100, 47,150, 47,200, 47,250, 47,300, 47,350, 47,400, 47,450, 47,500, 47,550, 47,600, 47,650, 47,700, 47,750, 47,800, 47,850, 47,900, 47,950, 48,000, 48,050, 48,100, 48,150, 48,200, 48,250, 48,300, 48,350, 48,400, 48,450, 48,500, 48,550, 48,600, 48,650, 48,700, 48,750, 48,800, 48,850, 48,900, 48,950, 49,000, 49,050, 49,100, 49,150, 49,200, 49,250, 49,300, 49,350, 49,400, 49,450, 49,500, 49,550, 49,600, 49,650, 49,700, 49,750, 49,800, 49,850, 49,900, 49,950, 50,000, 50,050, 50,100, 50,150, 50,200, 50,250, 50,300, 50,350, 50,400, 50,450, 50,500, 50,550, 50,600, 50,650, 50,700, 50,750, 50,800, 50,850, 50,900, 50,950, 51,000, 51,050, 51,100, 51,150, 51,200, 51,250, 51,300, 51,350, 51,400, 51,450, 51,500, 51,550, 51,600, 51,650, 51,700, 51,750, 51,800, 51,850, 51,900, 51,950, 52,000, 52,050, 52,100, 52,150, 52,200, 52,250, 52,300, 52,350, 52,400, 52,450, 52,500, 52,550, 52,600, 52,650, 52,700, 52,750, 52,800, 52,850, 52,900, 52,950, 53,000, 53,050, 53,100, 53,150, 53,200, 53,250, 53,300, 53,350, 53,400, 53,450, 53,500, 53,550, 53,600, 53,650, 53,700, 53,750, 53,800, 53,850, 53,900, 53,950, 54,000, 54,050, 54,100, 54,150, 54,200, 54,250, 54,300, 54,350, 54,400, 54,450, 54,500, 54,550, 54,600, 54,650, 54,700, 54,750, 54,800, 54,850, 54,900, 54,950, 55,000, 55,050, 55,100, 55,150, 55,200, 55,250, 55,300, 55,350, 55,400, 55,450, 55,500, 55,550, 55,600, 55,650, 55,700, 55,750, 55,800, 55,850, 55,900, 55,950, 56,000, 56,050, 56,100, 56,150, 56,200, 56,250, 56,300, 56,350, 56,400, 56,450, 56,500, 56,550, 56,600, 56,650, 56,700, 56,750, 56,800, 56,850, 56,900, 56,950, 57,000, 57,050, 57,100, 57,150, 57,200, 57,250, 57,300, 57,350, 57,400, 57,450, 57,500, 57,550, 57,600, 57,650, 57,700, 57,750, 57,800, 57

point. To apply a nailed link to the top of a stand-pipe connected with a main in the manner in question, was a most dangerous act, and such a thing ought never to be repeated without precautions quite easy of application, and which would be effective in obviating danger.

(Signed) J. W. BAZALGETTE, Engineer.
T. W. KNATES, Consulting Chemist, &c.

Of the seven persons who were so severely injured on the occasion of the explosion as to necessitate their becoming in-patients at the Middlesex Hospital, only two at present remain under treatment. These are Emma Bryant, the servant at No. 3, Charlotte Street, whose recovery was for some time extremely doubtful, and George Frite, the nephew of the landlady of that house, who was very seriously injured. One man, who received a severe scalp wound, has become an out-patient of the Hospital, and another, who was similarly injured, has been discharged. No other deaths beyond the two recorded at the time of the accident, have therefore taken place. An appeal on behalf of the sufferers was publicly made shortly after the occurrence, by the Chaplain of the Hospital, and it has been well responded to, the total amount already received being £81 3s. He now announces that, in consequence of the liberal arrangements that are being made for the sufferers, further contributions will not be needed. In the meantime, the work of restoring the broken main, and shoring up and reinstating the house property and roadway damaged by the explosion, is being prosecuted with great diligence. The trench at the corner of Bayley Street has been filled in, and the thoroughfare repaired; while in Percy Street, where probable danger was done, the pavement on the south side of the road has been again opened for pedestrians, and business resumed. There still remains much to be done in the way of rebuilding and making good the basements of the damaged houses; but the work is steadily progressing, and it is probable that in a very short time comparatively few signs will exist of the havoc caused by this remarkable catastrophe.

TRADE NOTES FROM SCOTLAND. (FROM OUR OWN CORRESPONDENT.)

The most important item of news in connection with gas affairs this week is the probable reduction of the price of gas in Glasgow to the extent of 2d. per 1000 cubic feet, a meeting of the Gas Committee of the Town Council was held last Thursday for the purpose of considering the Corporation gas accounts for the past financial year, which were found to be in a most gratifying state. It is understood that the Committee have secured such favourable coal contracts for the ensuing twelve months as to justify them in resolving to recommend the Town Council, the next meeting of which will be on Monday next, to reduce the price of gas to 1000 cubic feet, the reduction to be retrospective and to take effect from the last meter survey, which was made in the month of May. If the recommendation is approved of, the remission to the gas consumers of the city and suburbs will probably amount to something like £16,600, as compared with the greater sum of £20,000 which would have been required, considering the question of the cheapness of gas in Scotland, it is proper to remember that the Glasgow Corporation Gas Commissioners do not make any extra charge in the shape of meter-rent. Were such a charge levied upon the consumers, say to the extent of 3s. per annum (which is not the case in meter-rent in Scotland), there would be an additional item of annual income amounting to upwards of £13,000.

It has just been resolved by the Directors of the Linlithgow Gas Company to reduce the price of gas 6d. per 1000 cubic feet—from 5s. to 4s. 7d.—and it is understood that they have also resolved to supply a better quality of gas during the ensuing year.

The Mid and East Calder Gaslight Company have declared a dividend of 4 per cent. upon the profits of the past year's transactions. The price of gas is to remain the same as during the past twelve months—viz., 8s. 4d. per 1000 feet.

The Glasgow Gas Company's stock was inquired for last Thursday at 45s. 10s. per share, being an advance of 5s. per share.

After an enormous amount of talk and procrastination, the Falkirk Town Council have, at last, made a practical commencement of the scheme for supplying that town with water on a scale somewhat commensurate with the necessities of the community. Some time ago one of the members of the Council, by a fortuitous circumstance, devised an impromptu supply, which has in reality saved the town from a water famine, and but for which the state of matters in the town would long ere this have been desperate.

At the last meeting of the Council it was resolved to instruct Mr. W. Black, C.E., the Burgh Engineer, to proceed with the preparation of plans and specifications for carrying out a scheme of water supply in concert with the Callendar Coal Company.

The people of Stirling and its suburbs are still on "short commons" as regards their water supply, which was lately reported to be sufficient only for a fortnight. It is seriously contemplated by the Water Commissioners to form a new reservoir.

It was recently resolved by the Hawick Town Council to proceed with the Dodsburn water supply scheme, by which it is expected to augment the supply to the extent of 600,000 gallons per day, at an estimated cost of £12,692. Messrs. J. and A. Leslie, of Edinburgh, have been entrusted with the engineering part of the work, and the pipe contract has already been settled—£6430 for about 1500 tons of pipes.

The Wornit water supply has now been made available to the inhabitants of Newport by arrangement with the Water Commissioners of Dundee, pending the reconstruction of the Tay Bridge.

Rapid progress is being made with the construction of the new reservoirs in connection with the water-works for Paisley and Ayr—indeed, the one at Carchire, for the last-named town, is nearly completed.

At the last meeting of the Edinburgh and District Water Trust the annual accounts to May 15, 1880, were submitted and approved of. The estimate of expenditure was £65,172 18s. 3d., and the actual payments during the year amounted to £64,591 18s. 9d. There had, therefore, been expended £60 less than the estimate. Then the original estimate of revenue was £66,273 12s. 5d., whereas there had actually been received £68,832 2s. 11d., so that the year 1880 more than was anticipated. This shows a very satisfactory state of matters.

During the three months ending the 30th of June the average consumption in the Aberdeen was 4,378,780 gallons per day.

The new water-works for the town of Glasgow, which have been in preparation for some time, are now nearly ready to be completed. Two of the main features of the scheme (the general plan of which was excellent) were a large compensation reservoir on the Adder to keep up the minimum flow of water during the dry months of summer for the use of tenants and others on the course of the stream downwards to the River Clyde. This part of the work has been very successfully carried through, the new reservoir forming a fine sheet of water from 25 to 30 acres in extent, and 60 feet deep at the embankment. The other part of the scheme was a clear water basin, with storage to supply the town for about 20 days. The clear basin was placed in Knowes Dean, a deep narrow gorge at the foot of the hill, and it has been unsatisfactorily completed.

It has been resolved by the Wick Town Council to proceed with a water supply scheme devised by Messrs. M'Bay and Gordon, of Elgin, and which aims at bringing water from the Loch of Yarrows, the estimated cost of which, including reservoir, is set down at £5600.

The annual meeting of the Shareholders of the Kilmarnock Water Company was recently held, when a dividend of 7 per cent. on the ordinary stock was declared. Kilmarnock is the only town of any importance in Scotland where the water supply undertaking is in the hands of a private Company.

There was a sliding pig iron warrant market during the past week, and a very extensive business was done from day to day. As high as 55s. 7½d. cash was paid on Monday forenoon, and up to 55s. 4½d. cash was also paid on Friday forenoon, although in the afternoon the highest price paid was 54s. 10½d. one month. It seems that there are great expectations of an excellent autumn trade being done. Makers have advanced their prices 1s. per ton.

A very desponding feeling is showing itself in the coal trade, and prices remain exceedingly low, main coal being shipped at Glasgow at 5s. 6d. per ton, and splint coal at 6s. per ton, f.o.b.

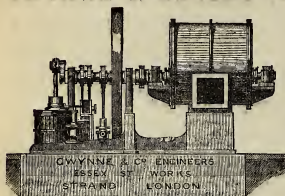
THE PROPOSED PURCHASE OF THE LINCOLN GAS-WORKS BY THE CORPORATION.—An extraordinary meeting of the Shareholders of the Lincoln Gaslight and Coke Company was held on Monday, the 26th ult. The principal business of the meeting was to consider the agreement made for the purchase of the Company's works by the Corporation. An opposition was raised on account of the large amount of money the Corporation would have to expend in connection with the purchase, and the objections of the Shareholders holding that they were entitled to 1 per cent. more than their statutory dividends. The agreement was, however, eventually adopted.

Share List of Gas and Water Companies.

Number of Shares issued.	NAME.	Amount paid up per Share.	List Div. p. Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	NAME.	Amount paid up per Share.	List Div. p. Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	NAME.	Amount paid up per Share.	List Div. p. Cent. p. Ann.	Latest Quotations.
58994	1 Alliance and Dublin	£ 0 10 0	0 10 0	17-17½	6200	5 Gas Companies, S. South Metropolitan.	£ 0 0 7 0 0	0 0 41-42	500000	1 Gas Companies, S. South Metropolitan.	100 0 0 10 0	10 0 204-207		
10000	2 Anglo-Romano	£ 0 0 10 0	0 10 0	21-23	300000	10 Gaslight Corpora- tion Gas	100 0 0 0 0 205-210	120000	5 Sk. Do., "B."	100 0 0 10 0	10 0 184-187			
1000	3 Bahian (Limited).	£ 0 0 10 0	0 10 0	23-27	115000	100 Gas Co. . . .	100 0 0 6 15 0 135-160	2800	5 Tottenham & Ed- monton	100 0 0 10 0	0 9-9½			
1000	4 Do., 1st pref.	£ 0 0 10 0	0 10 0	23-27	115000	100 Grimby Gas A.	100 0 0 0 0 186-190	12600	10 Do.,	100 0 0 10 0	0 6 0 7 0 0			
1500	20 Do., 2d. pref.	£ 0 0 7 10 0	0 10 0	20-22	100	10 Hampton Court.	10 0 10 0 0 15-16	1500	10 Window & Putney	100 0 10 0 10 0	0 114-115			
40000	5 Bombay (Limited).	£ 0 0 7 10 0	0 10 0	23-27	7500	100 Hong Kong (Lim.)	100 0 0 0 0 13-16	4000	10 Do.,	100 0 0 10 0	0 7 0 114-112			
10000	10 Do., fourth issue	£ 4 0 0 7 0 0	0 10 0	3-1pm.	5000	100 Horney	100 0 0 0 0 15-16	4000	10 Do.,	100 0 0 10 0	0 7 0 114-112			
225700	20 Brentford	£ 0 0 0 0 0	0 0 0	0	200000	100 Imper. Continental	100 0 10 0 0 157-185	24000	5 West Ham	100 0 0 10 0	0 81-84			
100	20 Do., 2d. pref.	£ 0 0 0 0 0	0 0 0	0	100	100 Kingston	100 0 0 0 0 115-123	32000	5 Woodfield, Plumstead, and Charlton.	100 0 0 10 0	0 0 14-16			
100	20 Do., D. shares	£ 15 0 0 0 0	0 10 0	95-98 gm.	100	100 Lea Bridge	100 0 0 0 0 115-123	2400	5 Woodfield, Plumstead, and Charlton.	100 0 0 10 0	0 0 14-16			
1500	20 Brighton	£ 0 0 10 0 0	0 10 0	35-36	50100	100 Liverpool United	100 0 0 0 0 125-133	16000	10 Do.,	100 0 0 10 0	0 125-133			
3000	20 Brighton and Hove	£ 0 0 10 0 0	0 10 0	35-37	181000	100 Do., B. . . .	100 0 0 0 0 125-133	16000	10 Do.,	100 0 0 10 0	0 125-133			
14000	20 British (Limited).	£ 0 0 10 0 0	0 10 0	35-37	386000	100 London	100 0 0 0 0 183-185	16000	10 Do.,	100 0 0 10 0	0 125-133			
7232	20 Cagliari (Limited).	£ 0 0 8 0 0	0 10 0	17-18	386000	100 Do., 1st pref.	100 0 0 0 0 183-185	16000	10 Do.,	100 0 0 10 0	0 125-133			
1500	10 Cairn Hatched	£ 0 0 10 0 0	0 10 0	9-11	7622	25 Do., A. shares	25 0 0 0 0 130-132	16000	10 Do.,	100 0 0 10 0	0 125-133			
550000	50 Commercial	£ 100 0 0 11 5	0 10 0	190-194	26292	100 Do., Debutante stock	100 0 0 0 0 137-138	16000	10 Do.,	100 0 0 10 0	0 125-133			
70000	50 Do., 7 per cent.	£ 100 0 0 8 0	0 10 0	183-184	15000	5 Malta and Mediterranean (Limited).	5 0 0 2 10 0 21-23	16000	10 Do.,	100 0 0 10 0	0 125-133			
20000	20 Continental Union	£ 0 0 0 0 0	0 0 0	0	6000	5 Mauritius (Limited)	5 0 0 1 10 0 11-12	16000	10 Do.,	100 0 0 10 0	0 125-133			
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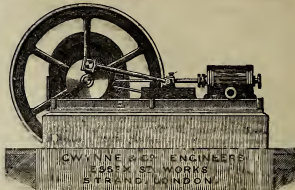
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EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

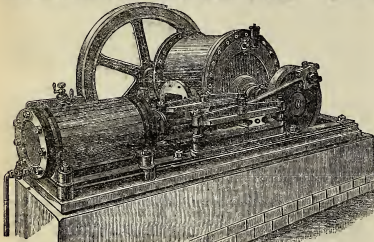
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[SEE ALSO ADVERTISEMENT, PAGE 198.]

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THE Maidstone Gas Company having sold its plant, offer the following Apparatus for Sale in good condition:—
SCRUBBERS—One Tower Scrubber 30 ft. high by 10 ft. diameter, with Distributor, and partly fitted with Livezey's boards.
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STATION-METER—By Milne and Son, in first-class condition, ornamental case, with Valves and Bye-pass complete; to pass 20,000 cubic feet per hour.
HYDRAULIC MAIN—Six 8 ft. by 18 in. Hydraulic Main D wrought iron; 24 ft. 9 in. by 18 in. Hydraulic Main D wrought iron. Nearly new.
REGULATORS—21 Bore, 15 in. diameter and 9 ft. long, in two pieces, 2 Ovals, 21 in. by 15 in. and 9 ft. long, in one piece. All of Stourbridge Fire-Clay, and in good condition.
For further particulars and price apply to **JOHN WARR, Engineer and Manager, Gas Works, Maidstone, April 21, 1880.**

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TO CORRESPONDENTS.

W.L.C.—Yes; under the 153rd section of the Public Health Act, 1875.
 E.H. writes: "Can you or any of your Correspondents give any information as to Hurd's Gas Engine, whether it is efficient. I believe it is made at Wakefield?"
 We have received from Mr. Robert Rawlinson, C.B., a copy of the Report of the Royal Commissioners appointed to Inquire into the Sewerage and Drainage of the City of Dublin and other matters connected therewith, recently presented to both Houses of Parliament, and shall take an early opportunity of referring to it in our columns.
 No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 10, 1880.

Circular to Gas Companies.

THE report of the Directors of The Gaslight and Coke Company for the half year ending the 30th of June is now before the public, together with the statement of the accounts of the Company for that period, and is remarkable chiefly for its extreme brevity. Seldom has a document of this nature and importance—possessing the character of an official retrospect and forecast combined, to show the position and prospects of an undertaking of such magnitude—been presented in such laconic terms. If the maxim that a nation is to be considered happy whose history is a blank may be accepted as truth—and experience has shown it to be such—then the same may be said of a trading corporation whose managers are enabled to give a satisfactory account of their stewardship for six months in four or five concise paragraphs like those which are before us.

The report commences by mentioning in suitable terms the great loss which the Company have sustained by the death of Mr. F. J. Evans, whose name was so long identified with the interests of the great organization which he helped so materially to strengthen and develop. We have already expressed our sense of the obligations which the Company owe to their late Engineer and Director, especially in connection with the Beckton establishment, and on the present occasion we need do no more than record the satisfaction which will be generally felt as to the recognition of his services now, as formerly freely manifested by his official friends and his colleagues. In the nature of things this will probably be the last time that Mr. Evans's name will appear prominently in the half-yearly reports of the Company, but we may be

assured that his memory will long continue fresh in the minds of those who knew him, whenever these semi-annual statements appear.

The Directors, as might have been expected, refer in guarded terms to the disastrous and altogether extraordinary explosion of the new trunk main in the neighbourhood of Tottenham Court Road, which lately brought their distributing arrangements into such unenviable notoriety. It is, of course, too soon to state the results of the disaster as affecting the Company; but the Directors are enabled to affirm that the consequences of the accident have proved to be less grave than they at first apprehended.

The Bill introduced by the Corporation of London, which would have seriously affected the Company, has been amended, the report states, through the interposition of the Board of Trade, with the concurrence of the Metropolitan Board of Works, and is consequently now less objectionable to the Company than as it originally stood; but beyond this negative qualification the Directors do not express any opinion respecting the measure.

The accounts to the 30th of June, the report concludes, show that the net profit, after providing for all preferential charges and maximum dividends on the "B" and "H" stocks, enable the Directors to recommend a dividend on the ordinary stock of the Company at the rate of eleven per cent. per annum; which the Proprietors will in all probability regard as highly satisfactory.

Turning now to the detailed statement of accounts, we find a few facts of general interest. Rather over £104,000 has been expended on capital account during the half year, which is considerably less than in the previous six months, when £179,364 2s. 5d. was so expended; so it will be seen that the Company are quickly but steadily getting through their authorized capital at the present rate, allowing for credits, of over a quarter of a million per annum. Coals, as appears by the revenue account, cost £455,364 8s. 6d., or about £400 more than during the previous half year, and about 7000 tons more common coal was carbonized. The receipts for coke, £113,517 2s. 2d., were over £6000 less than for the preceding period, a falling off in the quantity sold being visible; but 10,300 chaldrons less were used in manufacture. Nearly £28,000 more was realized from sales of tar than in the previous half year, while the revenue from tar products fell over £11,000. Ammoniacal liquor realized £3300 more, and sulphate of ammonia nearly £3700 more than during the half year ending Dec. 31, 1879. There was an increase of 164,586,000 feet in the quantity of common gas, and of 18,565,000 feet in the canal gas sold, which means that the Company have to provide every year for an amount of extension of their manufacturing plant equal to an entire gas-works for a good-sized country town. Such is the nature of the statements given in these accounts; for a more general purview of the Company's operations we must await the Governor's speech at the ordinary meeting, which will be held on the 13th inst., when certain subjects very lightly touched on in this report will probably be considerably enlarged upon and discussed.

The joint report made to the Metropolitan Board of Works by their Engineer and Consulting Chemist, upon the recent explosion near Tottenham Court Road, and which we gave in last week's issue, is a full and interesting account of the circumstances of the case. The Board ordered that copies of it should be sent to each of the Metropolitan Gas Companies, and they have accordingly been sent. The only "moral" drawn by the reporters is, "Don't test mains in 'which there may be a mixture of gas and air by applying 'a light to them'—a lesson hardly necessary to be read to the officials of Gas Companies. We have already remarked that only a condition of momentary insanity can explain the unfortunate act of the man who was the immediate cause of the recent accident, so contrary was it to what ordinary prudence would have suggested. In this respect the occurrence was an accident in the broadest sense of the term, against which it would have been morally impossible to guard. The narrative, however, of all the circumstances has an interest which goes beyond the conclusions reported to the Metropolitan Board, and the little pamphlet before us will be valued as a historical record of them.

We note that Sir Joseph Bazalgette and Mr. Keates are of opinion that there were seven distinct and separate explosions in the main, due to the accumulation in as many places of the requisite mixture of gas and air; and that, in the remainder of the tube, gas was present in sufficiently large or small proportion to avoid danger of explosion, but adequate to the conveyance of flame. We are unable to agree

with the conclusion so arrived at. Our observation of the local circumstances at the various points where the explosion found vent satisfied us that they were each of them comparatively weak places, where either the vertical depth was less than the average, or the lateral resistance was lessened by a near approach of the pipe to the areas of houses. These causes were apparent, and it is hardly probable that they would exactly agree with the local accumulation of the explosive mixture. If we assume that there was such a local accumulation in the length which lay under Tottenham Court Road at a depth of some nine or ten feet, is it probable that the force of the explosion would find vent by casting up that enormous weight rather than traversing the main for a distance of some fifty yards to find escape in Percy Street, where the depth was only two feet, and the resistance from that cause consequently almost *nil*? Again, the conditions at the end farthest from where the gas probably entered were such as to allow of an explosion of great violence; they were the same, according to the theory of the report, at the place where the gas was entering—namely, at the valve in Howland Street, because there also a considerable eruption took place. So that at both ends of the half mile—where the gas was finding ingress, and where consequently it is not unnatural to suppose it would be present in the largest proportion, and at that farthest away—the explosive conditions were found. Is it then probable that intermediately there were long reaches where such conditions did not exist? We are rather of opinion that the proportions of the mixture were fairly uniform throughout the length; that the main was, in fact, like an enormously elongated cannon, the charge of which would take some time to burn through; and that the force of the explosion was not immediately spent at the first opening, because, the material existing all along the length, fresh fuel was found right on to the end. The evidence was not clear as to there having been appreciable intervals between the several explosions. That the first took place where the light was applied we know; but that was inevitable, and says nothing for or against either theory.

The near approach of the time for the ordinary half-yearly meetings of the Metropolitan Gas Companies gives pertinence to the criticism of the position of the London Company, which appears in another column, in a letter signed "Vigilans." We mean no disparagement of our correspondent when we say that he possesses largely the wisdom which comes "after the event;" it is only another way of stating that he is capable of learning—while so many are not—the lessons of experience. Our views upon the general question of amalgamation, and upon its application to the London Company in particular, have been frequently stated in the "Circular," and we do not need to repeat them. We conceive that the questions of importance to the London Company now are the same as for some time past, except for their urgency—namely, first, Is amalgamation a good thing or not under their circumstances? and, assuming an affirmative answer to that, then, secondly, Is it probable that the conditions of such amalgamation will be more favourable to them later on than they are at present?

It appears to us that the London Company will favour prompt amalgamation or oppose it, just in the degree to which they have faith or not in a prosperous future for gas lighting. If we are blest with prosperous days, then, as "Vigilans" points out, so much the poorer are the chances of a good initial price when the inevitable application to Parliament has to be made; while if the dividends of the two Companies able to offer amalgamation continue to rise—and there seems no reason why they should not—so that the London Company are in that respect placed at a still further comparative disadvantage, they must be prepared to take terms based upon the privilege granted them. Thus prosperous days will prove unfavourable to the assumed policy of the London Board—that of maintaining their present independent existence, and we do not think that arguments based upon possible or probable times of great adversity will weigh heavily just now with Shareholders who are asked to forego a certain and considerable increase of dividend.

Gas Companies, we have frequently remarked in these columns, are looked upon, as a rule, by Corporations and Corporation officials, as "fair game" for almost any species of ill-treatment; but, for the perfection of sharp practice, commend us to the manner in which The Gaslight and Coke Company have been dealt with at the hands of the Corporation of London in the course of the passage through its final stages of the Bill introduced by the latter body for regulating the testing of gas and the recovery of forfeitures for

defective supply by the Company and the South Metropolitan and Commercial Companies. Our readers will remember how the Bill was first of all promoted by the Corporation without the concurrence of the Metropolitan Board; who, however, subsequently consented to assist in getting it passed, on being exonerated from the payment of any costs in connection with it. The Board of Trade then arranged for a conference between the three Companies, the Corporation, and the Metropolitan Board; and, after much negotiation, the provisions of the Bill were mutually agreed upon. The three Companies at once withdrew the petitions they had presented against it, on an undertaking being given them that, subject to the consent of Parliament, the Bill should be carried forward in its agreed form. In this way it passed the House of Commons as an unopposed measure, and was sent to the Upper House. On its appearance there, however, it was found to contain one entirely new clause and some very important modifications, made by the Remembrancer of the City, of which no notice had been given to the only one of the Companies—the Chartered—whom they concerned. The effect of the alterations thus sprung upon the Company, if the Bill had passed in its then shape, would have been that the City Authorities would themselves have been the arbiters in any dispute that might have arisen under its provisions; the Aldermen of the Corporation being empowered to try any case of complaint, in reference to the gas supply, arising within their jurisdiction. The Company refused to accept any amendment at all—least of all such an one as that proposed—of the agreed Bill; and, as the Corporation would not listen to reason, petitioned to be heard before the Lords Committee. In this determination they were supported by the Board of Trade, who intimated that unless the obnoxious clause was struck out of the Bill, it could not pass. To this the Corporation had to assent, and thereupon the Company withdrew the petition they had presented. So the matter thus far ended.

But the annoyance to the Company did not here cease, for when the Parliamentary Committee of the Metropolitan Board, at the meeting last Friday week, reported upon the subject, a member—who, by-the-by, is also a member of the Corporation, and therefore should have known the facts, and might have known them had he made inquiry, as he ought to have done before speaking on the subject—is stated to have remarked that "he thought the ratepayers of the Metropolis had reason to complain that they should be put to the expense of another contest in this matter after the Bill had been passed by the Commons, and after its provisions had been settled by the Board of Trade, with the consent of all parties concerned. Everything having been arranged amicably and satisfactorily, the Chartered Gas Company had determined, at the last moment, to put the ratepayers to all this expense. The power of a Company to adopt a course of this kind should, he thought, receive the attention of Parliament." Not content with a statement so utterly misleading, there appeared the following day, in a weekly newspaper with which his name is associated, a paragraph on the leader page directing attention to what the writer of it chose to call "a step which no one would have anticipated from the Directors of such a great and important public undertaking;" and about which he required "some explanation." Was any one so likely to be in a position to afford the needed explanation as an officer of the Corporation, who could easily have been applied to if the facts of the case were required to be known? After briefly referring to the Bill, and to the "keen and clever legal adviser" of the Company—one had need to be keen and clever in dealing with such people as the Corporation have shown themselves in this matter—the paragraph concludes: "We hope, now that the attention of the Board of Trade has been called to the matter, that the Directors of the Company will see the propriety of at once withdrawing the petition." The Directors of the Company have fulfilled the hope thus expressed, but simply because the need of the petition was done away with by the Corporation withdrawing the clause objected to. The whole proceeding only shows the unseemly way in which Gas Companies are frequently treated through ignorance and prejudice.

It is not every Gas Committee that has the pleasure of seeing its Chairman translated into a Cabinet Minister, and it would, therefore, be mere cavilling to find fault with the somewhat fulsome acknowledgments which, as appears by the last report, the Birmingham Gas Committee addressed to the Right. Hon. Joseph Chamberlain, M.P., on his resigning office in connection with the Corporation, in order to devote himself to the duties of his high position in Her Majesty's

Government. It is not necessary to quote in full the resolution passed by the Gas Committee on this occasion; it was, as we have said, excessively complimentary to the late Chairman, ascribing to him the success which has attended the operations of the department ever since its creation, and we can only hope that the illustrious recipient of these honours has left his mantle behind him, or we might be led to infer, from the terms of the resolution, that without him Birmingham will be desolate, and the Gas Committee like sheep without a shepherd.

The Committee, in the course of their report, allude to the pressing need that exists for better accommodation for the staff of the department, and for persons having business to transact with them, and it appears that efforts are being made to provide a new building for suitably housing the department and the new Art Gallery. They do not do these things by halves in Birmingham, and it may therefore be taken for granted that the Committee's new offices will equal anything of the kind to be found elsewhere.

The report states that the sale of gas for the half year ending the 30th of June was 1,388,741,200 cubic feet, or an increase of $\frac{3}{4}$ per cent. over the corresponding period of the previous year, and from the favourable state of their affairs the Committee hope to be able to reduce the price of gas in January next. Little was said as to the progress of the movement for the separation of the outlying districts from the undertaking, by transferring them to their respective Local Authorities. The Oldbury and Tipton arbitrations are not yet completed, and the Smethwick proceedings are postponed until the former disputes are settled.

The charges against Messrs. Brickwell and Malcolm, the Chairman and Deputy-Chairman of the Tottenham and Edmonton Gas Company, were submitted to the Grand Jury of Middlesex on Tuesday last, and by them summarily—we might almost say contemptuously—dismissed. "No true bill" was found on any of the counts of either of the indictments. Although it was difficult to believe in the possibility of any other issue, yet a sense of relief will be experienced by others besides the two gentlemen most interested, now that the case is finally disposed of. So far as it was within the power of the Court to wipe away the stain from two honourable names, it was done. Both the charge of the Recorder and the action of the Grand Jury go to show that the prosecution was one which should never have been commenced, and the defendants came out of the fire without having suffered in the ordeal. That the fairest character may be smirched by the casting at it of unlimited "mud," is an article of faith with most men; but we believe in this case the stains will be upon those who were the aggressors. From the commencement of the proceedings it has appeared to us to have been the two prosecutors who have been upon their trial, rather than the nominal defendants; and the discredit resulting from it—and there is much discredit—rests with them, and not with Messrs. Brickwell and Malcolm. The bringing of so grave a charge as that made could only have been justified by a strong compelling sense of public duty. When fairly open to the suspicion of interested personal motives, as in this case, it is difficult to speak too strongly in its condemnation. If anything was needed to show how baseless the whole of the charges and insinuations were, it was afforded by a special meeting of the Shareholders of the Company held last Saturday week. At this meeting, which was unusually largely attended, a resolution of confidence in the Directors was carried unanimously, and it was only in deference to the opinion of the Company's Solicitor, which was adverse to the expressing of an opinion upon a case which was then *sub judice*, that the Shareholders refrained from emphatically condemning the conduct of the prosecutors. Clearly the bulk of the proprietary is able to appreciate and remember the claims of past good service, and, as they have practically made an election between the old and the alternative offered, we cannot but congratulate them on their choice.

The agreement for the purchase by the Corporation of Lincoln of the undertaking of the Lincoln Gaslight and Coke Company was sealed at a meeting of the Town Council on Tuesday last, and the Corporation will take the management of the works on the 1st of July next year. The negotiations for the transfer have been very quietly and amicably carried out, and the city will become possessed of a thoroughly good property on very easy terms. Some opposition of a feeble character was offered to the sealing of the agreement, but it was too late, and of too little weight, to stay the proceedings. In the course of discussion the well-known plea of relief to

be afforded to the rates out of the gas profits was brought forward; but the gas consumers also found an advocate. It is, of course, too early as yet to tell how the administration of the undertaking will be eventually characterized, or whether the future Gas Committee will be guided by the example of Leeds, or Manchester, or of any of the hybrid specimens which may be found between those two extremes. Time will show; but meanwhile the gas consumers and their friends should not neglect any opportunity of educating the Council, if necessary, in the principles of sound finance during the year of preparation which still lies before them.

The Corporation of Norwich are disposed to do something very dreadful, but they do not precisely know what, in opposition to the British Gaslight Company, who at present light the town. Stirring speeches were made at the last meeting of the Town Council, with intent to prove that the gas consumers of Norwich have been robbed of enormous sums in the shape of excessive charges during the past, which the Council were called upon to prevent in the future; and, in the end, a resolution was passed referring to a Committee the whole question of the relations of the Gas Company with the town, with special instructions to them to report as to the best means of delivering the inhabitants from the monopoly possessed by the Company. An order for an inquiry into the possibility of the adoption of electric lighting for public purposes in the town was also tacked to the resolution. It is curious to observe how, in all cases of disagreement between a Local Authority and a Gas Company, the revenue which the latter derive from the gas consumers is always mentioned by the former as something contributed by the town, the interests of gas consumers and those of the locality being always fused together. But when the same Local Authority, by successfully trading on the sufferings of the gas consumers, become possessed of the gas undertaking, the consumers may be made to "bleed" quite as freely as before for the benefit of the ratepayers and the town, and the community thus becomes divided in a manner undreamt of when the Gas Company was the general oppressor of all. But this by the way. Some members of the Norwich Town Council are dissatisfied with the accounts of the British Gas Company respecting the working of their station in the town, and one gentleman has favoured his colleagues with a long statement of what the working results ought to have been. As he was not in agreement with the Company's accounts, he was pleased to charge little less than fraud on the Directors, in language which the mental intoxication induced by the frantic applause of some of his friends could alone have led him to use. We need not follow his arguments in detail, since it is plain that any one who selects his data from anywhere he pleases can bring his conclusions to any point he may desire. His arguments were ingenious, and he had collected his facts from all parts of the kingdom, bringing Belfast and Plymouth into close proximity for once; but, as the particular Company upon whose affairs he wished to throw light, have agreed to furnish detailed accounts when required, it would appear that they must be judged by their own statements, and the truth of those statements must be directly challenged in the only proper way. However, the Norwich Town Council may now rest awhile until their Committee have reported, and in all probability the warning uttered by one speaker, to the effect that nothing short of an application to Parliament for power to establish gas-works of their own would serve their purpose, will sink very deeply into their minds, and damp their enthusiasm by the certainty of a heavy bill of costs arising from such a radical procedure, without corresponding certainty of success.

The momentous question of the travelling expenses of the Gas Engineer of the Salford Corporation, recently referred to in these columns, is settled for the time on the old basis, the Gas Committee having succeeded in maintaining their position, although not without a tremendous conflict, in the course of which they were compelled to announce that in the event of defeat they would place their resignation in the hands of the Council. The whole affair reads very much like an account of a storm in a teacup; but, as an example of what some local representative bodies are prone to fall into, it is not altogether uninteresting. Salford is, of course, a rather exceptional place, being little more than a manufacturing suburb, and in consequence showing in its Corporation much of the same character that has from time to time made some of the Metropolitan Vestries so famous—a character which is perhaps better described by the word "parochial," than by any other. Considerable allowance must be made for a small individual suddenly thrust into a position in which he has

the power of influencing the fortunes of a business undertaking in which he has no direct pecuniary interest. Such men, of whom there appear to be several in the Salford Town Council, are frequently led into strange excesses by their zeal for reforming an administration whose very rudiments they do not understand, but it is consoling to observe that in the extraordinary case in point they failed to carry a proposal which would have inflicted lasting discredit on themselves and their colleagues.

The subject of scrubbers, particularly in relation to small gas-works, was pretty well ventilated at the recent meeting of the North British Association of Gas Managers at Perth, the first portion of the report of the proceedings at which we give elsewhere to-day, when the leading varieties of these useful appliances were all recommended by different speakers. Strenuous efforts were made to show that every sort of scrubber was a Scotch invention, or, if not, that it ought to have been; from which we may infer that scrubbers are growing in favour among our brethren beyond the Tweed. We are not disposed to enter into a controversy on this great question, feeling assured that from whatever source they originated their economy and other advantages are enough to recommend them to any part of the kingdom where clean and bright gas is desired, and nowhere is this in greater request than in North Britain.

Water and Sanitary Notes.

THE report of the Select Committee on London Water Supply made its appearance on Friday, and its full text will be found in another column. It is a document of very moderate length, and its purport may be described as embodying two proposals—first, that Sir Richard Cross's provisional agreements with the Water Companies should be set aside; and, secondly, that the responsibility of determining questions affecting the source, the nature, and the price of the Water Supply of the Metropolis should be remitted to a representative body, to be created by Parliament, and designated a "Water Authority." "Without absolutely prescribing" the composition of such a body, the Committee express their opinion that "it should include elements to be derived from the Corporation of London and the Metropolitan Board of Works, together with a due representation of the districts at present supplied by the Metropolitan Water Companies, which lie beyond the jurisdiction of the Corporation and the Metropolitan Board." This part of the report bears some resemblance to the clauses which were to have created a Water Trust under the Bill of Sir Richard Cross. But we miss the Imperial element, as represented by nominees of the Crown, and the holding of office "during the pleasure of Her Majesty." So far we acknowledge improvement.

To the Authority thus created, should Parliament adopt the proposal of the Committee, it is recommended that "the largest discretion" should be entrusted "as to the best method of dealing with the Water Supply of the Metropolis." Of course one method would be to buy up the existing water-works, thereby fulfilling the proposition which stands at the very head of the report—"That it is expedient that the Supply of Water to the Metropolis should be placed under the control of some Public Body, which shall represent the interests and command the confidence of the water consumers." But, very curiously, the Committee seem to contemplate the possibility of leaving the Water Companies out of the scheme altogether, the purchase of the existing water-works being treated as a sort of contingency which may or may not come to pass. Thus it is coolly remarked—"That for certain purposes, at least, it would be desirable to acquire the undertakings of the existing Companies, if the same could be obtained upon fair and reasonable terms." We cannot but think that the Committee, in agreeing to such a recommendation as this, must have been possessed by a very inadequate idea of what the existing water-works really are, and what is involved in the execution of such works. On this part of the subject, the Committee left themselves miserably in the dark. They had Lieut.-Col. Bolton before them, prepared with a mass of information of the most precise and comprehensive character, as to the nature and value of the London Water-Works; and nearly all that this witness was called upon to do was to enter into a sort of chit-chat with the Committee and the learned Counsel. The most substantial part of Lieut.-Col. Bolton's evidence was a document in the form of a letter, showing somewhat in detail what would be the advantages of transferring the present works to a Public Authority. But all this seems to

be passed by in the report, and there is a strange disregard of the magnificent opportunity which awaits a Public Authority having the entire command of the Companies' works. *The Times*, commenting on the paragraph to which we have just referred, says: "There can be little doubt that the existing undertakings would have to be purchased for the purpose of any such arrangement as is recommended." It is further observed by *The Times* on this point: "What is practically proposed is that the ratepayers should have a monopoly of their own water supply, and with this object it would be imperative to buy up the interests of those in whom a similar monopoly now exists."

The Select Committee must have been influenced by a very faint appreciation of the magnitude of the question they were dealing with, in fancying that a daily water supply of 140 millions of gallons was capable of being set aside as something obsolete and undesirable. Whether the colossal enterprise which at present furnishes one of the prime necessities of life to more than four millions of people is to be recognized or not, appears to be a very subsidiary matter in the estimation of this sublime Select Committee. With a wave of the parliamentary wand, a new supply, it is thought, may be introduced, to compete with that which now exists; and all the engineering skill which has given London an array of water-works costing £12,000,000 sterling is to go for naught. If there was extravagance in the contemplated terms of purchase, there is yet greater extravagance in the scheme propounded by the Committee. It is true that they refer to the purchase of the existing undertakings as one of the possible solutions of the question; but it assumes a by no means prominent position in their report. The introduction of an independent supply is distinctly contemned, and it is suggested that this could be obtained on easier terms than buying up the old works.

In sketching the future of the Metropolitan Water Supply, the Select Committee observe that "various courses might be adopted" on the part of the Water Authority. There might be a new Regulation Bill, or an independent water supply, or a purchase of the present undertakings. "It would be the duty of the Water Authority," says the report, "maturely to examine which of the three schemes, separately or in combination, would be most advantageous to the public." The Water Authority having made its choice, "the judgment of Parliament" would then have to be exercised, and possibly what the Authority proposed, Parliament would disapprove. Certainly the Water Authority cannot be created until next year, and it can have no scheme ready until the year after. In the meantime, the Companies will make progress in the way of business, and the value of their undertakings will increase. *The Times* expresses dissatisfaction with the manner in which the Committee have disposed of the provisional agreements. Thus we read: "On the whole, it is to be wished that the Committee could have offered more conclusive grounds for their advice that the agreements should be allowed to lapse." The argument concludes as follows:—"We should, no doubt, have paid heavily under the agreements which are now void, but it is difficult to look forward with much confidence to our obtaining much more favourable terms in the future." We are inclined to think, viewing the subject purely as it affects the public interests, that the future is rendered all the darker by the report of the Select Committee.

"Father Jean," in the columns of the *Echo*, is discussing the Water Question in language not always easy to be understood. We have our doubts whether on one point he himself quite comprehends the meaning of the report of the Select Committee. This, however, is a small matter, in the presence of such eloquence as the following:—"No arbitration must be suggested. We demand attention to two lines only—purchase, if reasonable terms are asked; if not, a scheme for a competing supply, which will leave the millions of London to work out their own destinies. We have no fear of the result." There appears to be more in this Water Question than we imagined, and "Father Jean" is clearly a much greater man than we thought him to be. He has the quality of soaring above all ordinary mortals. In discussing the legal conduct of the case before the Select Committee, he goes far beyond the old advice which tells the defendant's Counsel to abuse the plaintiff's Attorney. He quarrels with all alike. "Looking back," he says, "at the addresses of both Counsel for the City and the Board, we have no hesitation in saying that they lamentably failed to grasp the points the people desired to put forth, and, perhaps, if the Companies spoke their mind, they would express the same sentiments of their own Counsel." The zeal with which "Father Jean" puts the Metropolitan Board forward in preference to the

Corporation, is a singular feature in his letters. On the whole, we have not met with any writer of whom this eccentric scribe more forcibly reminds us than the oracular "Manhattan," who figured some years ago in the columns of the *Standard*. Unfortunately "Manhattan" no longer exists, or we might fancy we had a clue to the identity of "Father Jean."

A proposal for supplying the Metropolis with water from Bala Lake, in North Wales, makes its appearance in print, and is said to have been submitted to Sir W. Harcourt for consideration by the Select Committee on London Water Supply. The author of the scheme is Mr. J. W. Welborne, and his proposal is to convey the supply from Bala through a series of iron pipes, sunk to a depth sufficient to protect them from the action of the frost, along the "sidings" of the Great Western Railway to Stannmore, where enormous reservoirs are to be constructed. Thence the water is to be conveyed into the mains of the London Water Companies, the level at Stannmore being such as to give high pressure. We have not seen the estimate, neither are we told what the authorities of the Great Western Railway think of the project. The Select Committee say they "have not had before them any specific scheme for an independent supply of water, and general speculations on the subject are of little value without detailed plans of the sources from which it is to be derived, and the cost of carrying it into effect."

The Slough Authorities have just completed an extensive system of sewers designed to receive the drainage of the houses, but excluding the rainfall, the latter being provided for by means of the old sewers. The new sewers are also carefully constructed so as to prevent the infiltration of subsoil water. The contents of the new sewers will be applied to irrigation purposes. The house connections are not yet made. It will be interesting to learn by-and-by what is the difference between the discharge of the new sewers and the old, in respect to the degree of pollution.

The sum of £50 has been given by an unknown donor as the nucleus of a prize fund for an essay on the best way of carrying out the sewerage of Sydney, New South Wales.

The *Journal des Unions à Gaz* announces that M. Pelouze, one of the Directors of the Paris Gas Company, and co-inventor with M. Audouin of the condenser bearing their names, has been nominated an officer of the Legion of Honour.

TEN Wolverhampton magistrates last Tuesday fined a member of the Town Council 45s, and costs, for turning spent acids from his works into the town sewers, to the detriment of vegetation at the Corporation's sewage farm. The Town Clerk says the best mode of freeing the acid of its injurious qualities was to fill a hole with limestone, and let the acid percolate through it into the sewer.

The accounts of the Metropolis Gas Companies for the year 1879, 1880, 1881, in pursuance of the Metropolis Gas Act, 1860, The Gaslight and Coke Company's Act, 1876, the Scotch Metropolis Gaslight and Coke Company's Act, 1876, and the Commercial Gas Act, 1875, were issued on the 27th ult. We have had our usual abstract of the accounts prepared, and hope to be able to place it before our readers in the next issue of the *JOURNAL*.

Citizen in a recent issue said: "At a large commercial house in the City, some of the assistants have—very commendably—formed themselves into a fire brigade, for the protection of the premises. For the purpose of practice an alarm of fire was raised the other day, and recourse was had to the nearest of the hydrants recently erected by the Corporation for the special object of extinguishing conflagrations. The hydrant was found to be out of order, and therefore of no use." Concerning this we may remark that the hydrants were not erected to afford amusement, nor yet employment, for the class of men designated by our contemporary "assistants" in a City "commercial house"; neither are the London Water Companies bound to supply water to every set of persons who choose to form themselves into an amateur fire brigade, or else any abstraction of water from their mains might be justified on the ground that it was intended for use in practising fire extinction. We would suggest that the ignorance of the "assistants" as to the working of the hydrant prevented their obtaining a supply of water from the one they had recourse to, and that as they were meddling with what did not (under the circumstances) concern them, it was as well the apparatus was of "no use"—to them.

SUGGESTED PURCHASE OF THE ISLE OF THANET GAS COMPANY'S WORKS BY THE MARGATE CORPORATION.—At the meeting of the Margate Town Council last Tuesday, Mr. Bloxham moved, and Mr. Coleman seconded, the following resolution:—"That be it an instruction to the Improvement and General Purposes Committee to consider and report to the Council, at as early a date as possible, the condition and cost of the gas supply of the town, and as it is supplied to the Corporation; to consider the cost of constructing works for the manufacture of gas for the purpose of public lighting; and, if thought desirable, to open negotiations with the Margate Gas Company water-works by the Council. Mr. Bloxham said he was pleased to state that the water-works were being managed economically; they would pay their way this year, and there was every probability of a profit being yielded from them for the town. Mr. Walton thought the public were being misled with regard to the water-works, and he believed in two years time they would cost a cost of £20,000 on the town. After some further remarks had been made, the motion was put and carried, Alderman Chambers being the only dissenter.

Communicated Article.

EXPLOSIVE MIXTURES OF COAL GAS AND AIR.

By MR. W. FOWLER, M.A., &c.,
[Professor of Chemistry at the Middlesex Hospital.

THIRD AND LAST ARTICLE.

The property which gases possess of mixing together in opposition to the laws of gravitation was probably first observed by Dalton. He made experiments of the following character:—Two bottles were filled, the one with a heavy gas like carbonic acid gas, and the other with a light gas such as hydrogen. The latter was then inverted, and put in communication with the former by means of a piece of glass tubing several inches in length and about 1-20th of an inch in diameter, the tube fitting the neck of each bottle accurately, and being arranged in a vertical position. At the end of two or three days each bottle was found to contain a mixture of the two gases in the same proportions. Berthollet made similar observations with like results, but he took the precaution of keeping the two gases at a constant temperature during the whole of the time occupied in the experiments. It is to the late Dr. Graham, however, that we are indebted for a knowledge of the laws which regulate the admixture of gases under such conditions. He further observed that the tendency of two gases to mix together is not interfered with if the containing vessels are separated by thin plates of certain substances, such as compressed graphite, plaster of Paris, unglazed earthenware, and the like, provided these substances are in a dry state. It is also interesting to notice that Priestley, the eminent chemist, observed a similar phenomenon. In his experiments "on different kinds of air," he found that when different gases were transmitted through stoneware pipes surrounded by burning fuel, there was a loss of gas, whilst at the same time some of the combustion products of the fuel found their way through the substance of the pipe. This result was more surprising because the gas passing through the stoneware pipes was maintained at a pressure considerably greater than that of the atmosphere.

It is obvious, from a consideration of the circumstances attendant on Dalton's experiments, that the knowledge they afforded was the character of the ultimate result; they gave no information respecting the superior rate at which the hydrogen mixed with the carbonic acid gas. It also follows, from the nature of the apparatus, that if the hydrogen does pass through the long narrow tube more readily than the carbonic acid gas passes in the opposite direction, this must give rise to currents along the tube from the lower vessel in consequence of superior pressure. In order to avoid this disturbing influence, and to ascertain the rate at which a light gas, such as hydrogen, diffuses into a heavier, such as carbonic acid gas, Graham arranged his experiments in such a way that there was no hindrance to free expansion or contraction on the part of the gases produced by the process of diffusion. As a simple instance, let us consider the case of oxygen and hydrogen. If two jars of equal capacity be filled, the one with hydrogen and the other with oxygen, they can be placed over water, and the pressure inside each jar can be easily kept at the atmospheric pressure by raising or lowering it in the vessel of water. The vessels can be made to communicate by means of a horizontal pipe bent twice at right angles. If a thin plate of dry plaster of Paris has been placed in the pipe previous to its being bent, the process of diffusion is not interfered with, whilst currents of the mixed gases along the pipe, arising from slight inequalities of pressure in the two jars, are avoided. It was found that during the interval necessary for the passage of four volumes of hydrogen into the jar containing the oxygen, one volume of the latter gas had passed into the vessel containing the hydrogen. In the case of two gases such as hydrogen and carbonic oxide, the rate of admixture was found to be different from that obtained in the case of hydrogen and oxygen; and by experimenting on several pairs of simple gases, it was found that the rate of admixture was connected in a simple way with the densities or specific gravities of the gases operated on. The law deduced by Graham from his numerous and varied experiments is expressed as follows:—The rate at which two gases diffuse or mix together when freely communicating by an open pipe, or when separated by dry porous material, is inversely proportional to the square roots of their respective densities. For instance, in the experiments with oxygen and hydrogen, the densities of which are 16 and 1 respectively, the rate of diffusion of the oxygen is to the rate of diffusion of the hydrogen as the square root of the density of hydrogen is to the square root of the density of oxygen; that is, as $\sqrt{1} : \sqrt{16} = 1 : 4$. It follows, therefore, that we are able, from a knowledge of the laws of diffusion of gases, to determine the rate of admixture of two simple gases under given circumstances, if the specific gravities are known, and the pressures which they exert are not allowed to interfere with the simple process of diffusion.

The theory of the action whereby gases diffuse into each other, though separated by porous materials, is known as the molecular theory of gases. It assumes that gases are made up of small masses called molecules, without attributing to them a definite size. These molecules (molecules are an assemblage of atoms) are continually in motion, and this motion may assume different characters. The molecule may have motion as a whole; and in addition to this there may be motion, within certain limits, of its constituent atoms. In order to realize the facts of the diffusion of gases, we need only consider the motion of the molecule as a whole. The molecules of every gas, even when such gas is said to be at rest, are ever changing their positions with reference to each other and the sides of the containing vessel. The space occupied by any given molecule is infinitely small, and the distance through which it can move before its motion is arrested is also infinitely small. The molecules move in straight

lines until they strike against one another or the sides of the containing vessel, when they rebound with a velocity equal to that possessed before the collision. They still move rectilinearly in different directions. The molecules are thus supposed to possess the attributes of a perfectly elastic body. The number of collisions which a molecule sustains during a second of time is infinitely great. Equal volumes of different gases at the same temperature and pressure contain the same number of molecules; that is to say, the size of the molecules of different gases under these conditions is equal. The pressure exerted by a gas on the sides of its containing vessel is due to the collisions of the molecules against the sides. In the case of two gases of different densities, say oxygen and hydrogen, placed in different vessels at the same temperature and pressure, but separated by a thin plate of porous material, there is an equality of pressure on each side of the porous plate, maintained by an incessant bombardment on the part of the oxygen and hydrogen molecules. As there is the same number of each in each unit volume, and as they are of widely different densities, it is necessary for the maintenance of equal pressure on each side of the plate that the lighter hydrogen molecules should move with a greater velocity than the heavier oxygen molecules; they must deliver a greater number of blows per unit of time. The striking force of a body varies as its mass, and it also varies as the square of its velocity; hence it is proportional to the product of these two quantities. Now, although we do not know the absolute weights of the molecules of gases, we know their relative weights. These are proportional to their specific gravities. Calling the weight of the hydrogen molecule unity, the weight of the oxygen molecule is 16. Denoting the velocity of the oxygen molecule by x , and the velocity of the hydrogen molecule by x' , we have $x'^2 = 16x^2$ as the striking force on a given infinitely small area of the surface of the plate. Taking the square root of each quantity in this equation, we have— $x' = 4x$; or $x' : x :: 4 : 1$.

that is, the velocity of the hydrogen molecule is four times greater than that of the oxygen molecule. These numbers, representing the relative velocities of the molecules of the two gases under like conditions as to temperature and pressure, are inversely proportional to the square roots of their densities.

As the hydrogen molecules have a much greater velocity than the oxygen molecules, it follows that they make a proportionately greater number of contacts with the sides of the porous plate than the oxygen molecules do on the other side; and, consequently, a larger number are capable of passing the pores of the solid in any given time. The case is somewhat similar to what would happen if two individuals on opposite sides of a wire screen were to fire equal charges of fowling shot with an equal degree of accuracy, the one firing four charges during the same interval that the other fired one. The number of "shot corners" passing in one direction through the screen would be four times greater than that passing in the other.

It is necessary, for the process of diffusion to take place through porous material, that the substance be perfectly dry. If the material be moist, its interstices become choked with liquid, and the motions of the gaseous molecules are completely arrested. Hence it follows that a substance may vary very much in its behaviour towards gases in this respect, the variation being dependent on its condition of dryness.

It is not necessary, for the diffusion of two gases to take place, that they should be separated by porous material. A crack or fissure in the sides of the vessel separating them is sufficient to allow admixture of the two to proceed. For instance, a cracked jar containing hydrogen cannot be kept over water without a diminution of the total volume of the gas in its interior; and a similar result follows if the jar be sound, but closed by a well-ground accurately fitting stopper—supposing the stopper to be dry, and not greased. In each of these cases the surfaces of the glass are in contact only at points, so that the hydrogen molecules (and also those of atmospheric air) are able to make their excursions between the sides of the solid glass surfaces and escape.

We have seen that coal gas is a mixture of several gases. Hydrogen, marsh gas, and carbonic oxide make up the bulk of any given volume. The densities of these three gases are 1, 8, and 14 respectively. Taking atmospheric air as having a density of 16, it is obvious, from a consideration of the laws of diffusion, that each of these three gases has a superior diffusive power to that of air. The diffusive power of carbonic oxide is nearly equal to that of air. Its amount in coal gas at the present time is relatively small, as will be seen from the analysis given in my first article. Hydrogen comes first in diffusive power; and as it is by far the most abundant constituent of coal gas, it follows that in all cases where coal gas diffuses into atmospheric air the great bulk of the gas so diffused consists of hydrogen. This is a point of some importance, because the mixture formed by air and hydrogen has more explosive force, and its rapidity of inflammation is much greater than a mixture formed by the original coal gas and air. Further, its injurious effects when inhaled are not so great as those of a mixture of the original coal gas and air. The carbonic oxide does not diffuse much more readily than atmospheric air, and as its proportion relatively to those of hydrogen and marsh gas in the original coal gas is small, its proportion in the diffused coal gas is very considerably diminished. In our domestic arrangements the taps used for turning on the gas supply, unless greased, are always a medium through which the coal gas can diffuse. It is, therefore, important to know that the more inoffensive hydrogen is the gas which particularly escapes, whilst the dangerous carbonic oxide is, for all practical purposes, retained in the original pipes.

In connection with this subject I have to notice some processes whereby gases mix together in a manner different from that which

obtains in the experiments already given. If a jar be filled with hydrogen, and its mouth capped with a piece of moist bladder tied tightly round the neck of the jar, there is no opportunity for the hydrogen to escape, or for the air to enter, in consequence of direct molecular movements of either gas. The pores of the membrane are thoroughly closed by the presence of water. If such a jar, however, be introduced into a larger jar filled with carbonic acid gas, and the membrane kept moist, the latter soon commences to bulge outwards, showing an increase in the pressure, and therefore an increase in the gaseous contents of the smaller jar. In other words, the carbonic acid gas passes more rapidly through the moist membrane than the hydrogen passes outwards—a result of a reverse character to that obtained by the ordinary process of diffusion. The action in the present instance is due simply to the superior solubility of carbonic acid gas in water. If the bladder be allowed to become dry, the action ceases. If a jar filled with hydrogen be capped with an accurately fitting sheet of caoutchouc, and exposed to air, there is soon a marked depression of the surface of the caoutchouc, showing that the hydrogen is escaping more rapidly than atmospheric air is passing inwards. The explanation of these phenomena is that the gas passing through the membrane is reduced to the liquid state, and that there is a gradual transmission of such liquid particles from within outwards. The liquid particles re-assume the gaseous state on reaching the remote outer surface. Caoutchouc absorbs the gases present in coal gas, and more particularly the vapours of heavy hydrocarbons. Hence the smell arising from india-rubber tubing, when used for conveying coal gas, is due in a great measure to a continual evaporation of the constituents of the coal gas from the outer surface of the india-rubber tube. The process is therefore a continuous one, and not due to leakage in the ordinary sense.

Iron and other metals when at high temperatures behave towards certain gases much in the same way as caoutchouc. They have the property of absorbing them, and allowing them to escape from their remote surfaces. The gases absorbed are supposed to assume the fluid condition, and in this state are able to permeate the metallic partition at the high temperature. For instance, iron, at a high temperature, allows the passage of carbonic oxide through its substance; and it is by virtue of this property that steel is produced by the old process of cementation. But, though iron is permeable by carbonic oxide and other gases at high temperatures, we have no evidence that this is the case at ordinary temperatures. If there is a passage of a gas at the ordinary pressure through a plate of iron at the ordinary temperature, the cause is more likely to be due to the fibrous character of the iron and the thinness of the plate permitting the process of diffusion in the same way as a thin plate of a porous material.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE AMALGAMATION OF THE SOUTH LONDON GAS COMPANIES.

SIR,—The position of the London Gas Company has become peculiarly interesting. On all sides initial influences are apparent, and it is now clearly evident, not only that amalgamation must ultimately be brought about, but also that the delay which has taken place in considering this question has been and is being prejudicial to its interests.

The time devoted to meetings of Shareholders is not, as a rule, sufficient to express, or digest fully, the ideas which indirectly, as well as directly, bear upon the question; and I have consequently resolved to trespass upon your space, hoping that, when the next meeting of the Shareholders of the London Gas Company is held, full consideration on the part of all then present will have been given to the important issues at stake.

The arguments made use of by the Board—when, at the ordinary half-yearly meetings, this matter has recently been brought forward—have been those of confidence and expediency. They, in effect, say, "We know your business better than it can be known by any one outside. We are large Shareholders, so your interests are ours; and you may with perfect confidence leave yourselves in our hands. We do not foresee any proximate necessity of applying to Parliament for increased capital, as our works are in excellent condition, and there is space for increase for some time to come. We manufacture as cheaply, and sell cheaper than the Chartered Company. In short, there is no necessity to hurry; we can afford to wait; and meanwhile, if any Company wants to buy us, let them make an offer, and we will duly consider it." I do not think I here misrepresent, in the slightest degree, the position which the Governor and Directors of the London Company take up, and endeavour to hold on this question. It is a policy of masterly inactivity, and probably they may have felt that under the circumstances it was the best. Has it been so, however, or does it appear likely to be so towards the end which is now pretty evidently approaching? These are the interesting questions it behoves the Shareholders to study. Besides there is a somewhat grave suspicion as to the willingness of the Board to receive and consider an offer. I do not wish in the slightest degree to express a doubt as to the action of the Board being dictated by their sense of the interests of the Company; but Mr. Livesey made a statement at the last meeting, explanatory of what had been done by the South Metropolitan Company with a view to bring about an amalgamation, and of the manner in which it was received by the London Company; and there can be little doubt, from the explanation given, that the approaches of the sister Company had been received in a somewhat shy, if not a positively cold manner. It seems evident that an opportunity was lost, which, when it returns, may not find the London Company in the comparatively advantageous position it then occupied.

In questioning the prudence of the somewhat tardy action of the Board, I disclaim any want of confidence in the general management of the Company. I believe that, in the economical disposal of the business, the utmost care is taken and attention bestowed; but I am unwillingly forced to the conclusion that the higher-class qualities of management are to some extent deficient. Mistakes have been made, rather of omission than commission; and although these cannot now be corrected, or the position retrieved, still present action may prevent matters from becoming worse, and the best possible made of what can now scarcely avoid being an unfavourable bargain. According as it is managed, the ultimate, as well as proximate value of stock will be affected, and I think the issues are sufficiently important to warrant me in fairly considering some of the omissions I have referred to, and what their consequences have been.

The South Metropolitan Company, from their proportionately low capital as compared with revenue, have in recent times occupied a point of vantage amongst Metropolitan Gas Companies; and, while paying maximum dividends, they have been able to sell gas much cheaper than the others. This very point was, however, I believe, used against them in fixing the standard price under the sliding scale—as the Commercial Company in 1875, and the Chartered in the year following, were both able to obtain an initial price of 3s. 9d. per 1000 feet, whereas the South Metropolitan Company, which somewhat tardily, in 1876, adopted the views advocated by Mr. Livesey, were only enabled in that year to get a standard of 3s. 6d. Probably subsequent to this latter figure being adopted, the higher-class qualities of management have been difficult or impossible for the London Company to have succeeded in securing any higher figure; b. if, in 1875, or previous to the date of that arrangement, they had gone in for it, in all probability the London would have had identical terms with those accorded to the Commercial and the Chartered, because their conditions of capital and revenue much more nearly resembled these Companies than they did the South Metropolitan. Had they therefore (as in all probability they could have) obtained this initial price, a subsequent coalition with the Phoenix would either, as in the case of the Commercial Company, have enabled them to stand alone, or the South Metropolitan Company might have been absorbed upon something like equal terms—that is, the low initial price, combined with its comparatively small business, would possibly have formed a counterpoise to the high dividend-paying power of that Company.

It is fair, however, to look at the matter also from the point of view apparently taken by the Board of the London Company when the critical moment of decision arrived. The highest hopes at that time conceived nothing beyond a 10 per cent. dividend; indeed, very few imagined that Parliament, under any conditions, would have sanctioned a higher. The coal market was steady after a serious panic, and the 4s. 6d. per 1000 feet limit of price seemed a desirable margin to fall back upon for the maintenance of maximum dividends. The Board apparently decided that they were thus much safer than by adopting a lower initial price, above which a diminution of maximum dividends would ensue. They were probably frightened at what to-day would be considered a bugbear; they also probably disliked the auction clauses, which would have been a necessary accompaniment; and possibly there might also have been a very slight disinclination to follow the lead of another and a smaller Company. At all events they decided to await events.

Events have since declared themselves. The coal crisis can now be estimated, so far as the rise in price of gas necessary to maintain maximum dividends is concerned, and should the same difficulty have again to be encountered, it is, to say the utmost, not by the means likely that the 3s. 9d. or, in the case of those two Companies, the 3s. 6d. rate will have to be exceeded. Are the Board of the London Company, therefore, justified in acting as if they considered the high limit of price under their present powers really a necessity? And are the improvements which are now being rapidly introduced not tending to lower the much more moderate initial prices which have by the other Companies been accepted? How is the London Company to stand in popular favour with a 3s. and a probable 2s. 10d. general rate over South London in their neighbourhood?

If a consideration of these questions has already (as it probably has) staggered their former resolution, or rather irresolution, and they wish to retrace ground, do they now expect a 3s. 9d. or even a 3s. 6d. initial price? If not, and they remain as they are, is the Shareholder to be for ever content with a 10 per cent. dividend, while the Companies divide 11 or 12 per cent., or even a possibly higher ratio of profits? The Shareholder in general knows that the market value of his stock to a great extent depends upon the dividend, especially if there is a probability of that dividend being maintained; and he also knows, or ought to know, that should the Gas Companies of London become the property of a Municipality, as under the existing Government is not beyond likelihood, the valuation for purchase will be based on a certain number of years calculation of the legitimate divisible revenue.

Reconciliation is not always useless, but it is generally disagreeable. I have no wish to be disagreeable at all, but I cannot help being so to the extent necessary to prove my position. Viewed by our present lights, several Companies made the mistake of not at once adopting the sliding scale, as is evident from the higher dividends and superior value of stock of those Companies which did adopt it. The question of what is now to be done remains to be determined by the Board of the London Company—the only one, which may be properly called metropolitan, left out in the cold. No doubt they see, but hesitate to acknowledge, the position they have got into; and, as they know their strength as well as their weakness, probably the best policy now is to stir them up to do something, and to support them in doing it. That is the simple object of this letter. The writer believes that considerable time is being lost. A bargain is inevitable, and the longer it is delayed the more it seems pretty clearly to indicate that it will be less and less to the advantage of the London Company.

In conclusion, I have to explain that I desire, on the one hand, to avoid the appearance of attacking the Board under cover of a pseudonym; and, on the other, any suspicion which might arise that notoriety was the principal aim of my letter. To those interested, therefore,

should inquiry be made, I have no objection that my identity should be disclosed; but to the outside world, not especially concerned, I wish to be known only as
July 26, 1880.

VIGILANS.

MR. METHVEN'S TEST FOR ILLUMINATING POWER.

SIR,—I cannot but regret that Mr. Lyon's evident desire to be brief should cause his expressions to be obscure, and therefore difficult to understand. His first communication somewhat puzzled me; but that contained in your issue of the 3rd inst. does so to a greater degree. I suppose it is intended to support the erroneous statements made in his former letter; but it really is of such a character as to leave a careful reader in doubt as to whether your correspondent has or has not changed his views in respect to the Methven test.

Mr. Lyon describes, rather loosely, what he holds to be the principle of the test, and proceeds thus: "I presume Mr. Hartley does not dispute the ability to find such an aperture." If by the word "aperture" he means the slot in the screen, and also the position of the slot in relation to the flame of the Argand which has been adapted, I answer, Certainly I do not; and that to ask my reply to such a question, after what I have said and written, is absurd. Following the above, Mr. Lyon continues: "But he [Mr. Hartley] disputes the flame from which that pencil of light passes." By this I understand that he means the particular burner which he used, to which and to the 7-inch chimney I did not and do not object, because they are not what Mr. Methven accepts, and what he and myself employ. In addition, I may say that the loose and improper way in which Mr. Lyon conducted his experiments leads me to doubt whether the position which he elected for the slot, in respect to height and distance from the flame, were such as are necessary to prevent slight differences in flame length affecting the quantity of light passing through the slot.

In another paragraph Mr. Lyon quotes a passage from a letter which I wrote at the time when I believed Mr. Methven's project to be impracticable; but he has failed to realize the potency of the "if" with which the quotation commences. I am not disposed, however, to shield myself behind an "if," the more especially as I hold nearly the same views as I did when the cited passage was penned. It is not "literally true that slices (so to speak) cut out of the flames of different gases at a fixed distance between apex and base" are equal in illuminating power. As a matter of fact, however, there is a fixed position with the Argand flame of 3 inches length, where the difference in luminosity between the slice from rich gas and that from ordinary gas is so small as scarcely to be appreciable. Thus in my experiments the average readings with a slice of 14-candle gas was 7.20, and with 35-candle gas 7.225—a difference of 0.3 per cent.

Mr. Lyon says: "The candle is a common standard to the British gas consumer; but I submit Mr. Hartley is in error by opposing the light of it to the slice or pencil of light developed in a gas-burner." Well, I was unaware that the candle standard was "common" to gas consumers, or that they were in the habit of using parliamentary standard candles. Consumers who burn sperm candles generally use those, as I am informed by makers, which burn at the rate of fully 140 grains of sperm per hour. But let this pass. Why, however, am I challenged with doing exactly the opposite to that which I actually do, and ask others to do? I do not want operators to waste their time in opposing a "pencil" or "slice" of light from a gas-flame to the lights of a candle, or to the light of a pencil of candle. Why do I do so? The operators should use Methven's standard instead of candles, and so ascertain the power of the opposed flame by a constant, instead of by a variable standard.

In my former letter I asked these two questions: "Does Mr. Lyon mean that a 3-inch flame was in each experiment obtained with such extreme differences in the rates of consumption?" "Did he work with various lengths of flame?" Instead of giving an answer to each question, Mr. Lyon mixes the two questions together thus: "Are my experiments on the same gas but different heights of flame?" and replies "No." I may say they are. Are what? The same gas? or different heights of flame? or both? The answer is incomprehensible.

Mr. Lyon is concerned that the proposers of new standards "do not challenge the abuse of the candles in the authorized box photometer." I reply, that while the Metropolitan Gas Referees have sought for a new standard of illuminating power, they have not, to my knowledge, raised objections to the box photometer, or to the "abuse," as Mr. Lyon calls it, of the candles in that instrument; and, unless the Referees express an adverse opinion, it is little use for others to do so. I may, however, remind Mr. Lyon that I have always been an advocate for stationary lights and a movable disc in photometry, as well as the burning of candles or candles of a tolerably open space, and that 30 of my "Gas Analysts' Manual"; and I believe these conditions are absolutely essential to accuracy.

55, Millbank Street, S.W., Aug. 5, 1880.

F. W. HARTLEY.

THE GAS SUPPLY OF NORWICH.—At the last meeting of the Norwich Town Council, held on the 37th ult. Mr. G. White brought forward the motion of which he had given notice, and which was as follows:—"Several months having elapsed since this Council requested the Parliamentary and Bye-Laws Committee to consider the legal position in which the Corporation stood with the British Gaslight Company, and considering the urgent interests at stake, the Council urges upon the Committee the necessity of at once reporting as to what steps (if any) they advise to be taken in order to relieve the citizens from the unjust and unnecessary burdens imposed upon them through the extravagant charge made for gas. The Council also requests the Committee, in making the report, to take into consideration the question of electric lighting, as lately adopted by several corporations." The motion, having been seconded, was withdrawn in favour of one proposed by Mr. Willis—"That in view of the proved injustice sustained by this city at the hands of the British Gaslight Company, it is desirable to take immediate steps to obtain the aid of the Parliamentary and Bye-Laws Committee, and be accordingly instructed to obtain at once the most suitable legal advice as to the position of the Corporation with a view to the promotion of a Bill in Parliament for obtaining an independent supply, such Bill to take all necessary powers for the adoption of electric lighting if required." After a long speech by the mover of this latter resolution, it was put to the meeting and carried unanimously.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.

SESSION 1880.

PROGRESS MADE TO SATURDAY, AUGUST 7.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Ackworth, Featherstone, Purston, and Sharlston Gas Bill	Lords	Comms. Bill Feb. 9	June 25 Feb. 10	July 5 March 8	July 15 June 15	July 20 June 21	August 2
Birkenhead Borough Bill	Lords	Bill with- drawn.					
British Gaslight Company, Limited (Staffordshire Potteries), Bill	Lords	Feb. 10	Feb. 10	Feb. 23	June 17	June 22	
Barton-upon-Trent Corporation Bill	Commons	Lords Bill Feb. 9	June 24 May 27	July 5 June 4	July 20 July 23	July 28 July 27	August 2
Cardiff Water Bill	Commons	Feb. 9	Feb. 10	Feb. 16	March 11	May 25	August 6
Chester Gas Bill	Lords	Feb. 10	Feb. 10	Feb. 20	March 8	March 11	
Cork Gas Bill	Commons	Lords Bill Feb. 9	March 11 March 13	May 31 March 19	June 11 June 4	June 15 June 8	June 29
Cork Gas Bill	Lords	Bill with- drawn.	Feb. 10	Feb. 24	March 2	March 11	
Cork Improvement Bill	Commons	Feb. 9	Feb. 10	March 1	June 18		
Dagenham and District Farmers (Optional) Sewage Utili- zation Bill	Lords	Comms. Bill Feb. 9	June 25 Feb. 10	July 5 Feb. 16	July 15 June 15	July 19 June 24	August 2
Dartford Gas Bill	Commons	Comms. Bill Feb. 9	Feb. 10	July 16	June 23	July 29	August 6
Dearne Valley Water Bill	Lords	Comms. Bill Feb. 9	July 15	July 23	July 27	July 30	August 2
Denton and Houghton Gas Bill	Commons	Feb. 9	Feb. 10	March 15	July 6	July 15	August 2
Doncaster Corporation Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 16	May 25	August 2
Eastbourne Gas Bill	Commons	Lords Bill Feb. 9	May 28 May 27	June 8 June 8	June 22 June 24	June 25 June 28	June 29
Edinburgh and District Water Bill	Lords	Comms. Bill Feb. 10	Feb. 10	Feb. 16	Feb. 26	March 2	July 9
Exmouth and District Water Bill	Commons	Lords Bill Feb. 9	March 5 June 25	March 15 July 5	June 1 July 8	June 10 July 12	June 14
Gaslight and Coke, Commercial Gas, and South Metropolitan Gaslight and Coke Companies Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 23	June 11	June 24	July 19
Great Yarmouth Water Bill	Commons	Comms. Bill Feb. 9	Feb. 10	Feb. 17	August 3	August 3	..
Hinckley Local Board Gas Bill	Lords	Comms. Bill Feb. 9	July 6	July 15	July 19	July 22	August 2
Huddersfield Tramways and Improvement Bill	Commons	Feb. 9	Feb. 10	March 1	June 25	July 5	..
Hull Lighting Bill	Lords	Comms. Bill Feb. 9	June 29 Feb. 10	Feb. 16 Feb. 16	June 29 July 8	July 8 June 24	..
Hyde Gas Bill	Commons	Feb. 9	Feb. 10	Feb. 16	June 14	June 24	August 2
King's Lynn Corporation Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	June 19	July 23	August 2
Lancashire County Justices (Water, &c.) Bill	Commons	Feb. 9	Feb. 10	Feb. 23	June 14	Preamble	not proved.
Lancaster Corporation Bill	Lords	Comms. Bill Feb. 9	July 6 Feb. 10	July 15 Feb. 16	July 22 June 9	July 26 July 5	August 6
Lincoln Gas Bill	Commons	Lords Bill Feb. 9	Feb. 10	Feb. 16	March 11	March 13	June 29
Liverpool Corporation Water Bill	Lords	Comms. Bill Feb. 9	March 16 Feb. 10	June 7 Feb. 16	June 15 March 12	June 24 June 18	July 19
Liverpool United Gas Bill	Commons	Comms. Bill Feb. 9	Feb. 10	Feb. 16	July 6	July 13	July 19
Loudon Gaslight Company Bill	Lords	Comms. Bill Feb. 9	Feb. 10	March 12	June 8	June 21	August 6
Maidstone Gas Bill	Commons	Comms. Bill Feb. 9	Feb. 10	Feb. 24	July 19	July 22	..
Malton Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 24	July 1	July 8	..
Oldham Improvement Bill	Commons	Comms. Bill Feb. 9	Feb. 10	Feb. 23	June 22	July 1	..
Phoenix Gaslight and Coke Company Bill	Lords	Comms. Bill Feb. 9	Feb. 10	March 8	June 11	June 24	July 19
Portmadoc Water Bill	Commons	Comms. Bill Feb. 9	Feb. 10	March 8	June 11	June 24	August 6
Prescot Gas Bill	Lords	Bill with- drawn.					
Preston Improvement Bill	Commons	Lords Bill Feb. 9	Feb. 10	Feb. 16	May 31	June 3	August 2
Rathmines and Rathgar Township (Varty Water Supply) Bill	Lords	Lords Bill Feb. 16	Feb. 10	Feb. 16	July 14	July 20	..
Rathmines and Rathgar Township Water Bill	Commons	Comms. Bill Feb. 9	Feb. 10	Feb. 23	June 7	June 17	..
Reading Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	May 12	May 12	..
Rochester Corporation Bill	Commons	Comms. Bill Feb. 9	Feb. 10	Feb. 16	June 7	June 10	..
Sea Water Supply to London Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	June 15	June 25	August 2
Sligo Borough Water Bill	Commons	Comms. Bill Feb. 9	Feb. 10	Feb. 16	June 7	Preamble	not proved.
South Metropolitan Gas Company Bill	Lords	Lords Bill Feb. 9	Feb. 10	Feb. 16	June 7	June 14	..
Southwark and Vauxhall Water Bill	Commons	Comms. Bill Feb. 9	Feb. 10	Feb. 16	June 7	June 14	..
Stafford Borough Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	June 7	June 14	..
Wakesfield Corporation Water Bill	Commons	Lords Bill Feb. 9	Feb. 10	Feb. 16	June 7	June 14	..
Wandsworth and Putney Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	June 7	June 14	..
Wigan Improvement Bill	Commons	Lords Bill Feb. 9	Feb. 10	Feb. 16	June 7	June 14	..
Wrexham Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	June 7	June 14	..
Yeadon and Guiseley Gas Bill	Commons	Comms. Bill Feb. 9	Feb. 10	Feb. 16	June 7	June 14	..

HOUSE OF COMMONS COMMITTEE.

THURSDAY, JUNE 17.

(Before Mr. ABEL SMITH, Chairman, and Mr. H. B. SAUNDERS, Lord MORISON, and Baron HENRY DE WOLFF, Mr. BOWMAN-CARTER, Referee.)

CORK GAS BILL.

(Concluded from page 183.)

Mr. GRANVILLE SOMERSET said he would proceed with his evidence before the Committee.

Mr. G. W. STEVENSON, examined by Mr. GRANVILLE SOMERSET.

I have known Cork for many years, and was concerned for the Corporation of that city in opposing the Company's Bill of 1866, which resulted in the management being made between the parties. I was also engaged in the case of the Provisional Order of 1873 before Mr. Vernon Harcourt, the Commissioner appointed by the Board of Trade. That application was made under the Gas and Water Facilities Act, 1873, for an increase in the price of gas, to enable the company to pay a dividend of 5 per cent. They asked for 6d. per 1000 feet in addition to the price they were authorized to charge, and the Corporation proved—or thought they proved—that 3d. was sufficient; but the Commissioner reported that the Company ought to have an additional 6d., with which they paid more than the 5 per cent. they asked to be authorized to pay. In the present Bill the standard price proposed to be fixed is 4s. 6d. per 1000 feet inside the lighting limit, and 5s. outside; but I think the 4s. 6d. ought to be turned into 3s. 6d., and the 5s. into 4s.; if there is to be a differential rate at all. I find it is not absolutely unknown to have two standard prices in an Act of Parliament, but I was under the impression, when I made my report to the Corporation, that it was unknown.

Mr. MICHAEL said it was workable, but he would admit it was difficult, and had better be avoided if possible.

Examination resumed: I have analyzed the accounts of the Company for the year ending June 30, 1879, and I find that there was spent on coals £33,945, and received for the same £29,424, so that the net cost of raw material was £3446, being 3s. 3.36d. per ton of coals, and £300d. per 1000 feet of gas sold. The working expenses of the Company were £15,579, or 29.96d. for 1000 feet sold. To the gross sum of £3446 for coals, less residuals, I add £15,579 for working expenses, making together £19,025, and I find this must be added to the £155,000 of gas sold in 1879—155,000 cubic feet—which works out to 29.25d., to which is added the sum required for dividend and interest, £11,445, which is equal to 17.62d. per 1000 feet, making in all 46.90d., which is close upon 47d., or in round numbers 4s. per 1000 feet. But then I say, by conducting their other property, that by making a greater quantity of gas per ton of coal, and reducing their leakage to a point which is reasonable and proper—they may save another 3.74d. per 1000 feet, and bring the net cost of coal at the consumers' meters, including dividend and interest, down to 43.16d.; and inasmuch as their working expenses are very large—being 29.96d. per 1000 feet of gas sold—I say the standard price of gas ought not to be more than 3s. 6d. per 1000 feet. The quantity of gas per ton of coal is extremely small—only 8902 feet—while the usual make, not in London alone, but what is usual in this country, is considerably over 10,000 feet per ton. I am Consulting Engineer to Scarborough, Colchester, and Ramsgate, and many similar places, where the make is 10,000 feet of gas and upward per ton. I also say that the leakage is a great deal more than it ought to be. The bulk of the city of Cork is upon an island between two branches of a river, and is almost on a dead level, and the bulk of the consumption lies in this district. The mains that run into other districts can be very readily controlled by adopting a different plan to the one the Company have in use. Instead of a main, as you lay him, they could contour the line, and in this way place their governors on a gradually rising main; and as gas gains a pressure of an inch of water for every 100 feet of altitude, it is very easy to understand how to keep down the pressure. I had for instance, from 1853 to 1860, the charge of the gas-works at Halifax, and when I went there the unaccounted-for gas was 29 per cent. I introduced strict governors there, and reduced the amount of leakage to something less than 10 per cent. At the present moment it is under 9 per cent., and in that town the varying altitudes are small, about 100 feet; but there is nothing like that in Cork. I had also for several years the lease of the gas-works at Tipton, where the unaccounted-for gas was 40 per cent., but I reduced it to less than 20 per cent., and could have reached a lower point if I had had a permanent interest in the undertaking, which I had not. It is quite possible to bring down the unaccounted-for gas at Cork to within 10 per cent. It was 20 per cent., but has been reduced to 12 per cent. by the use of 20 per cent.; and the Company have nothing to do but to go on in their improving ways, and they will very soon have a great deal more gas to sell with less expenditure for coal. There is nothing peculiar in Cork to cause the necessity for such excessive leakage. London is tolerably flat, but at the present time The Gaslight and Coke Company—then called the Chartered Company—used to lose about 14 per cent. of their whole make of gas.

Mr. MICHAEL: They did not lose the whole of that?
 Witness: They absolutely lost it; it did not come to book. We call unaccounted-for gas an account of loss, and it is lost in the books of the company for money. A few years ago the unaccounted-for gas in London was about 14 per cent., but the average is now 5.56 per cent., and some of the Companies are working so low as 3.42 per cent. There is also the neighbourhood of Birmingham, including a very considerable mining district, where the unaccounted-for gas is 12 per cent. It is necessary to keep up the surface, and where the surface is continually falling in, and the mains are broken—which has no parallel in Cork; but even there the unaccounted-for gas over the whole of the district is under 20 per cent., while the mining district by itself it does not exceed 12 per cent. Upon one portion of the district I have mentioned, however, the leakage was calculated at 15 per cent.

Examination resumed: The particular district I refer to is Tipton. There was an arbitration in respect to the sum to be paid by Tipton, West Bromwich, Oldbury, and Smethwick, asking the supply of gas into their own hands. The unaccounted-for gas in the district was 20 per cent. the grand total of the whole is 13 per cent. or thereabouts. A standard price has to be calculated to meet the exigencies of a gas company, and to give them their maximum dividend and the interest on their borrowed money, and if the standard price proposed in the present Bill be fixed, it will be simply giving the Cork Company a further amount for dividend which will be taken out of somebody else's pocket; and I therefore propose 3s. 6d. Even without the correction I think ought to be made, the price works out at something under 4s., taking the Company's own figures. I have seen Mr. Anderson suggest that I had left out the sum which was put aside for depreciation, and I thought that came out of profits.

Mr. MICHAEL: Out of revenue.
 Witness: Out of profits. They must make profits before they can set aside anything for depreciation. Revenue means income, and gross income has to be made before the expenditure is necessary to earn it.

Examination resumed: The money powers unaccounted for are £36,000, and the Company propose to raise additional capital which will give them about £66,000; but they do not need additional capital at present, because

they have plenty to go on with for at least six years. The true reason for coming to Parliament is that they may turn their 5 per cent. into 10 or 11 per cent., or even into a 12 per cent. dividend.

Mr. MICHAEL (in cross-examination): Do you agree with this—"No objection can be made to the raising of the capital, or to the manner in which the Company propose to raise it, except in some small matters of detail which are not of importance?"

Witness: Yes, I do; but I do not say one word as to whether they require new capital or not. If they do, there is no objection to the amount; they might as well have double what they ask for.

Cross-examination continued: A standard price would not apply to a corporation at all, because when they manage a gas undertaking the limitation of profit which is required by the Gas-Works Clauses Act, 1847, is struck out, and the corporation do their business without any limitation of profit at all.

Mr. MICHAEL said that with reference to differential rates on the standard price in the Precedents in Private Bill Legislation, compiled by Mr. G. W. Stevenson, "there were six instances of such rates being sanctioned by Parliament, and he cited the cases of Bournemouth and Hemel Hempstead.

Witness: I confess I do not know how they work out.

Mr. MICHAEL: It shows that Parliament has adopted it, and that we are not asking for a new thing?

Witness: No; but, generally speaking, if Parliament sees a blot it is corrected.

In your calculation have you allowed anything for a reserve-fund?—I have not, because it does not go into the cost of gas.

Have you allowed anything for insurance?—No.

Have you allowed anything for bad debts and allowances?—No.

And yet, with all those omissions, you arrive practically at a sum of 3s. 11d.—that is, 46.90d.—?—Yes.

That is under our bad system of working by using cheap coals?—Yes; more than our cost of the Welsh coals are. I used to buy coals works on lease at Tenby, and imported Newcastle coal all the way there.

You carried your London prejudices down to Wales?—No; I am not a Londoner, and have no London prejudices. On the contrary, I think London has a great deal to learn in many things.

Have you any objection to Mr. GRANVILLE SOMERSET's Newcastle coal, wherever it can be had seaworthy, is the best to be used, and is taken all over the world for gas-making. It yields the largest quantity of gas of good illuminating power, and it leaves the best residuals—good hard coke, and sufficient tar and ammoniacal liquor. I have heard that Mr. Anderson recommends all the Cork Gas Company to use it.

Mr. H. E. JONES, examined by Mr. CLIFFORD.

I have, in order to give evidence, analyzed the accounts of the Company for the year ending December, 1879, and I say that, according to those accounts, the establishment of a standard price or a sliding scale of dividend at the rate suggested by the Bill, would conflict a hardship upon 80 per cent. of the Company's shareholders, and would deprive the surplus profits at the present time, and are working extravagantly in several ways. Their cost of manufacture is too large; the leakage is too great, and they are not making so much gas as they ought to obtain from their coals; and they are also getting rid of surplus profits, disguising them by carrying costs to a number of small funds, most of which I think are not quite regular.

Mr. CLIFFORD: I find suspense-account, £488; depreciation-fund, £700; bad debts, £348?

Witness: That is not bad debts merely; it is a reserve-fund for bad debts, and meets contingencies which may or may not happen.

Examination continued: I find roughly that they are now able to reduce the price of gas by something like 8d. per 1000 feet. They are charging 4s. 6d., which gives them 2s. 1d. profit, whereas I find that something under 1s. 5d. pays their dividend and interest. This leaves a margin of 80 per cent. of the Company's shareholders, and provides first of all for the reserve-fund, £415; insurance-fund, £200; depreciation-fund, £700; suspense-fund for bad debts, £348; and a suspense-fund for meeting the defalcations, as it appears to me, of some former Accountant, £488; altogether amounting to about 63d. out of the 84d., leaving them some 21d. of surplus profit. I find that in the year 1879, it was something like 20 per cent. I see by their last report that they are aware it is excessive, and are renewing certain pipes and covering them with asphalt, and doing all they can to reduce their loss to a minimum. I now find the unaccounted-for gas is about 14 1/2 per cent. only, showing that they are already, without any suggestion from outside, largely reducing it. I do not think there are any special circumstances in the case of Cork to render this leakage essential or unavoidable.

By Mr. MICHAEL: I have never been in Cork myself; but I have taken the Ordnance map, which has the levels marked upon it in plain figures, and I find that the ridge of the land runs from the bank of the river, the average of the buildings are upon a moderate level.

Examination resumed: Having regard to the levels, I think the Company might bring the leakage down to about 10 per cent., and I know that in some irregular towns, so far as the levels go, it is below 10 per cent. At West Cork, for instance, the levels are very low, but the greater part of the buildings supplied are at great elevations, but the leakage for the past year was only 7 per cent. As to the cost of manufacture, I find that the Company have spent in wear and tear and in wages sums amounting to 818d. for the latter, and 692d. for the former—together, 151d.; but unless the rate of wages in Cork and the surrounding districts is beyond what I can imagine, these figures should not be more than 6d. for wages and 45d. for wear and tear—together 101d., or something like 41d. less than they are. I am speaking from general experience, because these items fluctuate a little; but taking the case of these works, making something like 10s. 10d. instead of 12s. 18s. I also think the increase in gas consumption is very fair. With regard to the production of gas from coal, I agree generally with what Mr. Stevenson has said. Welsh coals producing only 7000 feet per ton, cannot be worth using, and I think the Company are working very badly indeed in buying them. The wisest course would be, if Newcastle coal comes to no more than 18s. per ton extra, to use that coal alone, from which they would produce gas of 14 candles illuminating power, and extract from 10,000 to 10,200 cubic feet per ton. Having regard to all the circumstances of the case, I am of opinion that the Company could sell gas at 3s. 6d. per 1000 cubic feet, allowing for all the usual charges for wear, profits, and interest, and still have a extra margin over this, and I would allow 2d. for fluctuations which occur from time to time. I should consider 3s. 8d. would therefore represent a very fair price for a sliding scale standard in Cork. In arriving at this conclusion I have already added 2s. per ton above the price now paid for coal, and have taken it 12s. instead of 18s. I also think the increase in gas consumption will continue, and so enable the Company in the future to reduce the cost of production, and thus make more profits. Having regard to the

circumstances of the Company, I do not think they require additional capital. They are a long way from having exhausted the powers they already possess; and the amount now applied for is very much out of proportion to what is sought to have. They have already raised £150,000, and therefore £335,000 asked for does not represent sufficient money to carry them over for any length of time, except for the balance they have remaining uncalled up. If they had exhausted all their capital, and were applying for more, as they profess to be doing, they would have asked for another £150,000, to carry them over a fresh term of ten years. I should think their present unexhausted capital will last them two or three years; but I have not specially gone into this question. Looking at the absence of apparent motive for applying to Parliament, and looking to the amount of surplus profits, I am of opinion that the effect of obtaining the Bill would be to confer a 10 per cent. dividend immediately upon the Company.

Mr. CLIFFORD: For this explanation of the opinion expressed by Mr. Lane, that by the 1st of January the gas would be lowered in price?

Witness: Yes; and it also confirms my view that the Company would at present be able to make a reduction.

Examination continued: Assuming the result of the Bill to be to make the Company a 10 per cent. paying Company, the effect of such a provision upon the clause enabling the Corporation to purchase must be to increase the purchase-money by 25 per cent.; but I am not aware that a purchase is imminent.

FRIDAY, JUNE 18.

Mr. Jones recalled, and cross-examined by Mr. RICHARDS.

I am not aware that Mr. Harcourt, who sat as an impartial judge, allowed 15 per cent. for the leakage. In my scheme I have not made any allowance for a reserve-fund, but I have previously said that I have not charged a dividend every year. I have not, in my estimate, made any allowance for insurance, because I do not consider it to be a legitimate reduction in addition to a reserve-fund. I have not allowed anything for depreciation, but I have allowed for wear and tear a sufficient charge on the gas to renew as well as repair the works. I have, however, made an allowance for bad debts. In my figures I have not compared London with Cork, although I have arrived at a result similar to Mr. Stevenson; but I have allocated to the different charges for manufacture a rate which, according to my experience, will be just. I do not consider it to be absolutely fair to institute a comparison between Cork and London.

Mr. RICHARDS: Can you conceive two places which it is more ridiculous to compare?

Witness: Yes, because in London we have the disadvantage of paying the very highest rates for wages and for manufactured iron goods.

Cross-examination continued: For a comparison I would rather go to a company making gas on a small scale—say 300 million feet a year.

Mr. RICHARDS: Would you not also go to one dependent on coal-fields situated as near as may be in the same direction?

Witness: Yes; but I may say my evidence is based on other grounds—viz., upon the gas sold, and not upon the gas made, which is the most convenient mode of comparison.

Cross-examination continued: All companies with which I am connected charge a rent for their meters. It amounts to about 1d. per 1000 feet. Any extra tax in a city like Cork must be taken into consideration, because the rates and taxes paid by the Company there are nearly as high as in London; and I believe there is a probability of an abatement in the future, which will ensure to the benefit of the Company. In my estimate, however, I have accepted the figure they are now paying. The adoption of the sliding scale would confer a mutual benefit, but it would be larger to the consumer than to the shareholder.

Mr. RICHARDS: You are quite right; but it is more proper to the consumer—that is to say, the reduction of 1d. to the gas consumer may amount to £5000 a year, whereas a quarter of that may be added to the dividend, or only about £1200?

Witness: Yes.

Cross-examination continued: I have no hesitation in saying that the sliding scale is a good thing, provided that the initial price is carefully considered, and this does require very careful consideration. In one part of London the standard price is 3s. 6d. per 1000 feet, and in the case of The Gaslight and Coke Company it is 3s. 9d.; and I think in Cork it would be fair to adopt a scale of 1d. under the latter price, bearing in mind that the dividend in Cork is 3 per cent. and not 10 per cent. With regard to residual products, Cork has a great advantage over London. A larger amount of these residuals is produced in London than in Cork, but there is no great sale for them, while in Cork a large sum is obtained for them. I quite agree that the larger the scale of manufacture the cheaper should be the fixed charges, and I have made an allowance for the same. The price allowed 3d. in Cork, whereas in London the amount is not more than 3d.; but a ton of coal will not make more gas in Cork than in London. I have not come here to say whether a dividend of 8 or 10 per cent. is best, but the Cork Company have accepted 8 per cent., and I think it ought to remain at that figure.

Mr. RICHARDS: There is no proposal to do otherwise than remain at 8 per cent. so long as we remain at the initial price. There is no direct proposal to alter the price of gas and the dividends of the shareholders?

Witness: There is no direct proposal, but I am afraid if this Bill passes it will lead to that.

The effect would be that there might be a rise in the dividend, but then there would be a corresponding reduction in price?—Yes; but then you have a quantity of surplus earnings, which have accumulated altogether to £15,000, and you are continuing those earnings; it is therefore obvious to me that you could reduce the price very largely, and share the extra dividend.

Is it not out of those surplus earnings, and those alone, that we can have any possibility of reducing the price?—No; there is always the chance of your reducing the scale.

By "surplus earnings" you mean the reserve-fund?—No; you have of late years charged a large amount of money to a variety of funds.

Re-examined by Mr. CLIFFORD: Under the present Act of the Company, so soon as the legitimate reserve-fund is full they must reduce the price of gas; it is not optional. The effect of the present Bill would be to offer an equivalent to the consumer, but with an additional satisfactory dividend to the Company. In my estimate I have not made any allowance for increased residuals derivable from increased consumption of gas; I have given them the benefit of this in the future. Of course as the Company go on increasing their business, as we are told they are doing considerably, the proportion of capital to the amount of business gradually becomes less, and the dividend on the capital follows the same course, and in this way they will be able to supply gas cheaper. The improvement of a company's circumstances by the operation of increased consumption from time to time is to be noted all over England. It is from this cause that the price has been reduced from 10s. per 1000 to 8s. 6d. in London; and to the advantage of this economical working the consumers are, of course, clearly entitled. My report was founded upon comparisons between provincial and suburban companies more on a scale comparable with the Cork Gas Company than a large London Company would be, and

I do not believe there are two figures in my valuation, as it is prepared in detail, which correspond with those of Mr. Stevenson.

Mr. NAGLE: Is not the consumer better protected by the adoption of the sliding scale than by the procedure of the Gas-Works Clauses Act?

Witness: Yes; but the initial price, upon which the whole thing turns, is very carefully investigated before it is settled.

A MEMBER OF THE COMMITTEE: In your estimate of 3s. 8d. per 1000 feet, do you take into consideration the question of meters, because, as I understand, the Company supply meters without any charge?

Mr. STEVENSON: That was the case.

A MEMBER: Is that arrangement to be discontinued?

Mr. NAGLE: No; we only seek to be relieved from the obligation where the meter does not produce anything—where there is no consumption from it.

A MEMBER: You apply for further powers with regard to the sale of apparatus; does this include gas-meters, because you have made a considerable point of the fact that your Company do not charge for meters, whereas all other companies do charge, and therefore some allowance should be made in this respect in favour of the promoters?

A MEMBER: It all depends upon the circumstances of the case, whatever the price might be, or whether the Committee thought the Company might put on a gross price, including the meters.

Mr. STEVENSON: I distinctly put the question whether, in his estimate of initial price, the witness had taken into account the cost of the meters.

Witness: I have taken into account the cost of repairing and renewing meters; but mine is an expenditure account, and not an estimate of revenue. I have not set out that the effect of charging a rent would add another penny to their receipts, which would therefore go into their pocket.

At the same time, if they give a thing away, they must be allowed for it to some extent?—Meters are not things involving much capital. It is a question of interest on capital more than anything else, because I have allowed them the expense of keeping them up.

Mr. NAGLE: Have you allowed for new meters?

A MEMBER OF THE COMMITTEE: Do you know whether the Bill continues or discontinues the arrangement by which a consumer is provided with a meter free of expense?

Witness: I admits the present arrangement to go on excepting in cases where it appears to be somewhat reasonable—where the consumer does not burn much gas. If he does not burn 5s. worth of gas in the six summer months, for that time the Company should be allowed to charge a rent for the meter. It would only apply in the case of small consumers.

Mr. ALFRED PEARCE, examined by Mr. GRANVILLE SOMERSET.

I have examined the accounts of the Cork Gas Company for the half years ending Dec. 31, 1878, and June 30, 1879, and I have eliminated from those accounts certain items. I find there is an absolute profit of £7445 16s. 4d. for one half year, and £8769 11s. 9s. for the other half year. That profit is produced after every single item of expenditure has been taken into account, including the cost of the gas, as the amount of profits, out of which must be paid the statutory dividends, amounting to £10,832, on a capital of £135,400, being a surplus profit of £3383 8s. 1d. I merely make a proportion sum of that, and I find, taking the quantity of gas sold and the surplus profit, it leaves a balance representing 520d. per 1000 feet of gas. There will also be a saving in the cost of the gas of 74d. by making 10,000 feet per ton of coals, and by reducing the leakage to 10 per cent., and selling or bringing to charge 9000 cubic feet of gas per ton of coal carbonized. All the figures I have taken are those of the Company, and I make no abatement for any supposed want of economy in the management.

Mr. MICHAEL: I thought you said you had eliminated something?

Witness: Yes, I have; but for the reason that the particular form of the Company's accounts—which I believe they are not responsible for—does not bring into revenue sums which ought to be charged to it. There is also a charge of £1000 a year, which is deducted from the profit and loss account, and adding to the expenditure account.

Mr. MICHAEL: That is quite right, and I objected yesterday that Mr. Stevenson had not done so.

Examination resumed: In my statement with reference to the revenue account for the half year ending Dec. 31, 1878, the first item is "Profit and loss on the Company's balance-sheet," amounting to 6s. 6d. I say that this balance of profit is too much, because the Company have not brought against revenue certain charges which have been carried to profit and loss, but which ought to have appeared in the revenue account. The first item is "Sundry charges," amounting to £172 9s. 4d.

The second item is £36 19s. 9d., and the third is £20 11s. 3d. "Bad debts and allowances," £147 3s. 2d., and "Debiture and bank interest," £471 4s. 6d. These sums added together amount to £848 8s. 2d.; and I conceive all those items ought to have been charged to revenue account before the gross profit is arrived at. This, by my process, brings the balance of profit for the half year down to £7445 16s. 4d. I do the same thing with the next half year's accounts, taking £478 13s. 3d. for sundry charges; insurance, £54 3s.; law expenses, £4 2s. 6d.; bad debts and allowances, £48 18s. 11d.; and debiture and bank interest, £169 13s. 6d.; which together produce £1035 10s. 10d.; and reduce the net profit in the half year to £639 10s. 4d. The same thing I do with the next half year, which produce £14,215 8s. 1d.; and by taking off the dividend on the share capital, £10,832, it leaves the sum of £3383 8s. 1d., which I have previously spoken of. There is also one other sum of 37-1d., which I have arrived at in the way the Committee have already heard of. I assume that the Company will use 9000 cubic feet of gas per ton of coal, and that they will use 10,000 cubic feet of gas for every ton of coal they use, and if they employ proper care in attending to the mains and pipes they ought to sell about 9000 feet. I therefore say there will be first a sum at the disposal of the Company of 520d. for excess of profit, and that they can use it as they please.

By "excess of profit," you mean the surplus increase in the price of coals sold?—Yes; and it is necessary that I should add the item of "sundry charges in profit and loss account, omitted in revenue account," amounting to £1291, or 198d. per 1000 feet; and also the dividend and interest, £11,445, or 1762d. per 1000 feet. This brings out a total of £31,761, or 4588d. per 1000 feet of gas sold. I would now like to deal fairly with the Company, and I will add for the possible increase in the price of coals 18d. per ton on 17,322 tons, which quantity is sufficient to produce, at 10,000 feet per ton, the quantity they sell. This amounts to £1290, or 2d. per 1000 feet in addition to the 4588d., and I say that 18d. per ton provides for using Newcastle coals entirely. I know something of Newcastle coals, and I do not think that 18d. per ton is too much, as I have seen Newcastle coals. However, this 2d. per 1000 feet gives something for the increased cost of coals, and this brings the price up to 50-88d. Now I have to make a deduction from that of £3383, produced by the sale of gas at 4s. 6d. and 5s. per 1000 feet, which amounts to 520d. per 1000 feet; and also for improved working in

selling 9000 feet of gas per ton of coal carbonized, 374d. per 1000 feet. These two sums together amount to £841, which, deducted from 50'88d., leaves 41'94d.

A MEMBER OF THE COMMITTEE: I do not understand that last item—"Improved working in selling 9000 cubic feet?"

Witness: I venture to contend that the Company's sale of gas is small compared with what it might be if they reduced their leakage, and the make of gas is small as compared with what other companies, with no better capacity, are doing; and therefore I say that, by fairly good working, they may increase their divisible profits by 374d. Then I add that to the 5'20d., which comes out in their accounts as before described, and this produces 8'94d. and leaves the standard price of gas, as shown by these figures, at 41'94d. I consider, however, that it would be a fair and proper thing to add to this something for contingencies which may happen—I do not know what they may be, but there are all manner of things which may arise in connection with the working of a gas establishment—and, therefore, I allow an additional sum of 3'06d. which will increase the price I have brought put to 41'94d. per 1000 feet sold as a proper standard price. The addition to the 41'94d. of the 3'06d. represents a sum of £1087.

MR. SOMERSET: Supposing your view to be adopted, what percentage of dividend should the Company be able to pay, supposing the Bill passes? Witness: If the price inserted in the Bill is passed by the Committee, they will at once be able to divide 1½ per cent. extra—that is 9½ per cent.—without any reference to the economies which might ensue through the increase of gas made, and the consequent increase of gas sold.

MR. LUCKY: I am sorry to hear that the fallacy you have just committed. Before they can divide this amount they must take 6d. off from the price of gas, and how much will that reduce the profits?

Witness: For every penny they take off, £650; or, in round numbers, a total of about £3954.

What not that, once reduce the profit below 8 per cent.?—No; I explained that to enable this to be done the leakage must be reduced to 10 per cent., which it is quite possible to do.

Did you not state to the Committee that the moment the Bill was passed the profit made by the Gas Company would be 9½ per cent.?—Witness: To that extent, I say that I did.

You are sufficiently candid to acknowledge that profit cannot be earned unless there are great changes?—I acknowledge that they have, according to the present working, only £3880 to enable them to reduce the price by 6d., which would not give them 1½ per cent. more dividend, but this sum alone would give them 1 per cent.

Have you made any allowance for an insurance-fund?—Certainly not. I have made my calculations on a standard price which shall be necessary to pay all the expenses of making gas and providing the statutory dividend. Now, as this dividend is going to slide backwards and forwards, my estimate that it will be put into the reserve-fund and to the insurance-fund cannot arise until the Company obtain a profit over and above the sum which will be produced by the sliding scale and the standard price.

According to the new state of things it is provided that 1 per cent. may be laid aside for the reserve-fund and 1 per cent. for the insurance-fund?—Yes, if you can make it.

Before it can be laid aside it must be made out of profit, and therefore such a price must be provided as will enable it to be done?—I do not interpret the clause in that way.

Where else can it come from?—Out of the sum the Company will receive by increased coal and skill in carrying out their operations.

In your statement, taking the 18s. 9d. accounts, in seeking to compute what the surplus profit would be, after paying 8 per cent., you made no provision for a reserve-fund?—Under the old circumstances, if the reserve-fund was not full, the Company could have taken every shilling of that £3880 and added it to this fund before being compelled to decrease the price of gas.

As the Company supply meters gratuitously, must there not be a depreciation-fund to meet the expense of their maintenance?—Ordinary wear and tear is supposed to cover everything, because if a meter is put out in the year 1, in the year 100 it will still stand there, or another will represent it. Every year sum is spent in maintenance, which will repair this meter as long as it is good enough to repair, and replace it when it is dead.

With regard to coal, your assumption is 10,000 feet of gas are obtained from Newcastle coal at the price of 13s. 9d. per ton. I obtained the figures from the Accountant: 13s. 9d. one half, and 13s. 9d. another; and 13s. 6½d. another; which brings the average cost of Newcastle coal to 13s. 7d. For Welsh coal the average is 10s. 10d.

Was not that 13s. 9d. the average price of the coal used on the works?—No; it was under 13s. I have taken 12s. 1½d. as being the mixture of a certain proportion of Newcastle and Welsh coals; the same as the Company have used.

You have made no allowance for the difference in order to obtain your 10,000 feet, using Newcastle coal?—Indeed I have; I have added to it 1s. 4s. a ton.

I thought that was for possible increase in the price of coals?—No; a portion of it was for the present increase by using Newcastle coals, and something for future increase in price.

But Newcastle coals cannot be bought for 14s. 6d.?—If they could not they can be, if the Accountant's statement is correct.

Have you allowed anything for the increase in the price of freight and expenses?—I have allowed 9d.; I have divided the 1s. 6d. into two.

This is very much less than the absolute increase, using Newcastle coal at present?—I cannot say that, when the absolute average is 13s. 7d. for that three halfpence.

I suppose you agree that there never has been a time when gas has been produced so cheaply as at present, but that a change may occur?—Yes; it may.

Yet you are asking that the Company should be placed in a position in which the case of any extraordinary emergency should be covered for their future life?—If I had not allowed something for contingencies it should be open to that observation; but as I have added £3000 to their profits—represented by 3'06d.—I think I have endeavoured fairly to meet the case.

What are the circumstances with regard to Cork which render it different from London?—One thing is that in Cork the dividend is limited to 8 per cent., which is a considerable element in fixing the standard price, because a less amount is required to pay it. If I had to calculate these dividends at 10 instead of 8 per cent., my standard price would be higher.

You have said that the leakage can be reduced to 10 per cent.; do you, as a Gas Engineer, say there is the same ease in reducing the second 5 per cent. as there is in the first 5 per cent.?—No; but I say it can be done all the same, and 10 per cent. is now considered a high rate of leakage—or at least a normal rate.

What do you say about the average meter-per 1000 feet of gas consumed?—The real question is not what they pay, but what they will obtain as profit. The profit made by the whole of the London Companies in 1878 amounted only to the fifth part of a penny per 1000 feet sold.

That has nothing to do with the charge here. We save a certain amount

of meter-rent, which must be an amount unless we have a loss?—I may answer that by saying it is in the Company's accounts; and whatever loss there is it still leaves £3383 profit.

After the deductions I have brought to your notice—reserve-fund and other matters?—Yes.

What is about the cost? May I take it at 1½d. per 1000 feet?—No; I should not think about 1d. or 1½d.

I have had the result worked out for me—if no further capital were raised—that the Company could pay 9½ per cent. as soon as the Bill is passed?—But this is all a deduction, and 374d. is saved. It is always on that assumption, as I have stated to the Committee, I begin with.

Would not this necessitate a reduction in the price of gas of £4300?—Roundly it is £3900 odd.

Next year it will be £4200, owing to the increase of consumption after the Bill is passed?—I assume that the consumption will go on increasing, and the profit per 1000 feet will go on increasing, and this will provide, to some extent, for any increase of capital that may be necessary.

How much does 1½ per cent. dividend require?—£1500 on £135,000.

That is £650, and then 1 per cent. insurance, £1350?—If you put that in which I have not admitted.

You have told the Committee that if the Bill passed—and I am following it—and the insurance would be £1350; reserve-fund, £1950; making a total of £3850 required to make good your statement?—I am content, for the purpose of my argument, and if you tell the Committee I am wrong, I am wrong to that extent; but in my view they cannot lay aside a reserve-fund or an insurance-fund except out of profits made outside of the Bill.

But if they like to be content with 5 per cent., and made 6 per cent., they could then put aside the insurance and reserve funds?—Certainly, if they like to do that.

Then you entirely deny this contention?—No; I am giving them 8 per cent. upon their old capital—the same as they have been paying hitherto.

I say you are erroneous in your conclusion. You have £3930 to meet £3850?—No; I have £3930 plus the 374d. to meet a sum which will be required—viz., £4000.

Then it is £4000, and 1½ per cent. to pay the additional dividend?—£1950; that is £6000 at once. Do you agree to that?—Yes; in round numbers it is so.

It requires £1950 to do that?—Yes; plus the saving. The sum is £3212. That is £3812.

And 1 per cent. for the £1350?—No; I do not agree.

But you must take my figures?—I will add up mine first. I shall have £3812 to provide the money to pay £3931.

And have a reserve-fund of £1350 and an insurance-fund of £1950—a deficiency of £2700, according to your own figures?—I do not follow you there; there is the present moment sum of nearly £14,612 which may go to the reserve-fund, and therefore they cannot want, and would not be authorized to lay by 1 per cent. in addition. The reserve is £10,812; depreciation, £1981; insurance, £1800; making nearly £15,000; and I admit that, under the provisions of the Bill which now governs the Company, I have no right to depreciation or insurance-fund, but I admit they are entitled to make 10 per cent. upon their capital for a reserve-fund. They might, therefore, just as well have carried all those sums to the reserve-fund, which I venture to say is practically full.

By that, depreciation is insured by allowing the plant to go down, maintenance means not repairing alone, but keeping everything up to its proper standard. Maintenance is paid for out of revenue, and that means depreciation as well. The object of the reserve-fund is to allow the Company to equalize their dividends in the event of any contingencies arising, such as an advance in the price of coals or a strike. Many companies, from one cause or another have no reserve-funds at all; they reduce the price of gas too soon, or they have pressure put upon them. If, however, they stand upon their rights, there is no doubt they can, before being compelled to reduce the price of gas, fill up their reserve-fund; but they are not already entered into provisionally for the purchase of accidents that might happen out of the ordinary way—the instance of a gasholder, for instance, or something of that kind. This fund can only be drawn upon by the Company going to a Justice of the Peace, and proving to his satisfaction that such calamity had happened to them.

This conclusion is the case for the members of the Committee.

MR. GAVELL SOMERSET then addressed the Committee on behalf of the Corporation of Cork, and Mr. YOUNG on behalf of the consumers.

MR. RICHARDS having been heard in reply, the committee-room was cleared. Upon the Counsel and parties being called in.

The CHAIRMAN declared the preamble proved, the standard price to be 4s. within the city and 4s. 6d. without.

The clauses were then proceeded with and agreed to, with amendments, and the Chairman was directed to report the Bill to the House.

[The Company have since withdrawn the Bill.]

REPORT FROM THE SELECT COMMITTEE ON LONDON WATER SUPPLY.

The Select Committee appointed to inquire and report as to the expediency of acquiring on behalf of the inhabitants of London the undertakings of the existing Metropolitan Water Companies; and also to examine and report whether certain agreements, or any of them, already entered into by the Metropolitan Water Companies, or any of them, might be modified, or whether it might be expedient for the Companies, would furnish a satisfactory basis for such an acquisition; and further to inquire and report as to the nature and extent of the powers of the Water Companies to levy water rates and rents, and how far it may be desirable to modify the same; have considered the matters referred to, and have agreed to the following report:

1. That it is expedient that the supply of water to the Metropolis should be placed under the control of some public body, which shall represent the interests and command the confidence of the water consumers.

2. That under such management a greater efficiency, economy, and equality of charge than that which at present exists might be secured, the defects in the present provision for the extension of the same might be remedied, and better provision might be made for the health of the community.

3. That in order to effect the above-mentioned objects, a Water Authority for the Metropolis should be created, with statutory powers, which will enable such body to acquire and utilize, so far as may be deemed expedient, existing sources of supply, and to have recourse to such other sources of supply as, upon investigation, may prove to be available and desirable.

4. That in the absence of any single municipal body to which these functions could be committed, a Water Authority of a representative character should be constituted, and that a Bill for that object be introduced at an early date by Her Majesty's Government. Without absolutely prescribing the composition of such a body, your Committee are of opinion that it should include elements to be derived from the Corporation of London and the Metropolitan Board of Works, together with a due

representation of the districts, at present supplied by the Metropolitan Water Companies, which lie beyond the jurisdiction of the Corporation and the Metropolitan Board of Works. It is on such a body, when properly framed, that, in the opinion of your Committee, should devolve the responsibility of determining questions affecting the source, the nature, and the price of the Water Supply of the Metropolis. The subject is one which especially concerns the consumers of water, and should be left to the judgment of a representative body furnished with adequate power to give effect to such measures as, on mature consideration, may be desirable.

5. That for certain purposes, at least, it would be desirable to acquire the undertakings of the existing Companies, if the same could be obtained upon fair and reasonable terms.

6. Your Committee have investigated the terms negotiated for such a purchase in the agreements referred to them, which were provisionally concluded between the Metropolitan Water Companies and Mr. E. J. Smith. The amount of immediate annuities to be paid under the agreements is £773,454. To this would have to be added deferred annuities, to accrue by way of increments at various times, amounting finally to £326,400, making an ultimate annual payment of £1,099,854. The value of the immediate annuities in 31 per cent. stock, taken at par, would be £320,098,700, and Mr. Smith estimated the present value of the deferred annuities at £651,300, making the total value of stock under the agreements £971,398,700. If the deferred annuities had been capitalized at 31 per cent., the total amount would stand at £2,734,281. In addition to this, it would have been necessary to make provision for the debt charges—viz., preference and debenture capital, amounting to £3,061,500, bearing an actual annual charge for interest of £133,913, and also for the bond and mortgage debt of £2,055,000, bearing an annual charge for interest of £78,000. These interest charges Mr. E. J. Smith calculated would, as well as the annuities, be covered by the income of the Companies when transferred under the agreements. Adding these charges to the total of the annuities granted as above, the annual payments would have been finally £1,240,673, and the total capital value would have stood at £33,018,836.

Value of annuities	£273,428.1
Preference and debenture capital	3,750,000
Mortgage and bond debt	225,055
Total	£33,018,836

These agreements were founded on the principle of paying so much in the way of immediate annuities, in consideration of the existing net income of the Companies, and so much by way of deferred annuities, in regard to the anticipated increase from year to year of their revenue. The present net income of the Companies, which is the figure which has been most accurately ascertained and adjusted. It is admitted that the immediate annuities to be granted under the agreements were in excess of the actual net income realized in any year of which we have completed accounts. Mr. E. J. Smith, however, alleged that the annuities he proposed to grant would be met by the estimate net income for the year ending on June 1, 1881. But the question of the future increments is a matter, to a great degree, of estimate and speculation. Their amount must depend on numerous elements, which it is only possible to conjecture, such as the future rate of the growth of houses, and the probable increase in their value; the future rate at which the interest on the debt will be fixed; and the future capital which it may be necessary to expend. These are the elements from which the growth of the past has been compounded; whether they will increase or decrease, or remain stationary hereafter, is altogether uncertain. It seems that the calculation of increments on which the agreements were founded, was founded on the assumption that the items of receipt would grow at a greater rate in the future than in the past; that the number and value of the houses, and the rate of the rentals, would perpetually augment; but that, on the other hand, the growth of capital expenditure, which has hitherto been required in order to earn an increased income, would sink into insignificance in comparison with the growth from the calculation. This does not appear to be a sound basis of a financial estimate for the future. In the investigation before your Committee, the Corporation of London and the Metropolitan Board of Works have taken part. Those two bodies, on behalf of the water consumers, whom they represent, may be regarded as representing the public, and your Committee are of opinion that the terms contained in these agreements do not furnish a satisfactory or admissible basis of purchase; and in that opinion your Committee concur.

7. In the resolution communicated to your Committee by the Corporation of London, it was stated that the annuities to be paid under the agreements to the Water Companies was nearly £1,000,000, and that the market value of the property at a period immediately previous to the commencement of the negotiation. As a general rule, the market value of stocks of this description affords the best estimate, not only of the present, but of the prospective value of the community. The expectation of future improvement is an element which always enters into the consideration of the market value. It was, indeed, suggested that, in the case of the Water Companies, their affairs were not sufficiently well known to the public to enable a complete judgment of their value to be formed, and that their value was expected to be heavily overestimated. But during the past six months every possible light has been cast upon their affairs, and yet their market value is, at the present time, with a complete knowledge of their condition, still some millions below the price which was payable under these agreements. The value of the shares rose immensely on the disclosure of the terms of the agreements; they fell as soon as it was considered doubtful whether the agreements would be carried out, and at no time did they ever rise to the full value which would have been due to them if the agreements had been carried into effect. It is obvious, therefore, that the judgment of the public, as evidenced by the market price, coincides with the opinion of your Committee, that the Corporation of London and the Metropolitan Board—viz., that the price offered in the agreements is greatly beyond the estimated value of the property.

8. Your Committee are further directed to inquire into "the nature and extent of the powers of the Water Companies to levy water rates and rents, and how far they may be used to modify the same." It is evident that rates have been raised in recent times under the statutory powers of the Companies, and the evidence shows that a considerable portion, at least, of the increase in the receipts of the Companies has been due to this cause, as the increase per cent. in the net water-rentals for the last eight years had been, in the case of the Companies, greatly in excess of the percentage of increase in the number of houses.

9. The Companies claim the right still further to increase their rates in proportion to the growth in the value of houses, and this right would have no legal relation to the augmentation in the quantity or improvement in the quality of the water supply. The Companies would be entitled to any amount of dividend they could earn, as was contemplated by the Water-Works Act, 1847, there might be some reasonable restraint on their power to enhance the charges against the consumer. But the Companies assert their right, under the title of back dividends, to escape from any such restraint. Indeed, they think the Companies have the right to demand so large a price from the public for the purchase of their undertakings. The calculations on which the agreements were founded

proceeded to a considerable extent on the assumption that the claim of the Companies to back dividends was established. In the evidence of Mr. Smith, the possible amount of such dividends is estimated at nearly £20,000,000. The Counsel for the Companies contended before the Committee that the right to such dividends might be carried back to the origin of the Company, which accounts for the astounding figures given in the case of the New River Company of £15,000,000 as the amount of back dividend. The Counsel for the Corporation and the Metropolitan Board of Works maintained, on the other hand, that no question of back dividend could arise till the Act which introduced a limit came into force. Without pronouncing an opinion on the legal point, your Committee must observe that if the contention of the Companies is well founded, the population of the Metropolis and its suburbs, amounting to 4 millions of people, would be left at the mercy of certain trading Companies, armed with the power of raising the price of one of the first necessities of life to an extent practically without any limit—a situation from which the Companies seem to consider there is no escape, except in the purchase of their undertakings at such a price as they may be willing to accept. If that were the only remedy, the consequence to the consumer of the improvident legislation of the past would be indeed intolerable. But Parliament is not unequal to redress such mischiefs to the public interests. The manner in which the Gas Companies have been dealt with by Parliament may be referred to in illustration of the methods by which a remedy for such a state of things may be effectually provided.

10. Your Committee have not had before them any specific scheme for an independent supply of water, and general speculations on the subject are of little value without detailed plans of the sources from which it is to be derived, and of the mode of carrying it to the consumer. Your Committee would observe that the total value of the existing water supply to the Metropolis has not much exceeded £12,000,000, a considerable portion of which sum may be attributed to works which have become useless or have been duplicated. And it would become the duty of the Water Authority, when constituted, to consider, in the first place, whether the existing works are at all in their disposal, whether a new and better supply could not be obtained at a cost greatly less than the sum which would have had to be paid under the agreements for the existing supply.

11. In the constitution of the Water Authority, your Committee would recommend that that body should be entrusted with the largest discretion as to the best method of dealing with the Water Supply of the Metropolis. Various courses might be adopted. It would be possible to proceed by regulation of the powers of the existing Companies, as in the case of the gas supply; or by the introduction of an independent water supply; or by the purchase of the existing works and works, would be the duty of the Water Authority, mainly to determine which of these schemes, separately or in combination, would be most advantageous to the public. In order to give effect to any of them, further statutory authority would be necessary, so that the judgment of Parliament on any scheme adopted by the Water Authority would be finally reserved.

Aug. 3, 1880.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

(Before the MASTER OF THE ROLLS.)

DAVIS v. THE ISLE OF THANET GAS COMPANY.

To-day a motion was made on behalf of the defendants, asking that the judgment pronounced by the Court on the 29th of June last be varied, and stand as follows:—That the Court do order that the Gas Company be restrained from laying or continuing pipes under the public road running from Margate to Birchington, which traverses the plaintiff's property, and from allowing any pipes to remain therein." It will be remembered that the object of the action was to restrain the defendants from laying or continuing any pipes under the plaintiff's land, or within the limits of any other land of the plaintiff, without his consent. The plaintiff, who is the owner of an estate at Westgate-on-Sea, and also the Birchington Gas-Works, alleged that the defendants broke up the soil of Street Hill, and commenced laying pipes along the road in the direction of Birchington, and that they had laid down the pipes in the plaintiff's land, and that they had laid pipes along Street Hill, as they were authorized under their Act to supply places "adjacent" to Margate, Ramsgate, and Broadstairs, and contended that Birchington was an "adjacent" place within the meaning of the Act. "The dispute in the action being whether Birchington was an adjacent place, and whether the Court decided it was not, and granted the injunction asked for.

The MASTER of the ROLLS now varied the order as asked, and intimated that the injunction granted was solely confined to the *locus in quo*—namely, where the pipes were pulled up.

CENTRAL CRIMINAL COURT, LONDON.—TUESDAY, AUG. 3.

THE EXTRAORDINARY CHARGE AGAINST THE DIRECTORS OF A GAS COMPANY.

At the opening of the Court this day, THE RECORDER, in concluding his charge to the Grand Jury, said: There is only one other case with which I need trouble you, and it is a very remarkable one. It is a charge against two gentlemen who occupy respect as the Chairman and Deputy-Chairman of the Tottenham and Edmonton Gaslight and Coke Company. Upon the indictments before you they are charged, I suppose, as Directors of the Company, with misappropriating gas under the provisions of an Act of Parliament, which provides that "if any Director of the Company shall fraudulently take or apply to his own use or benefit any of the property of the company, shall be guilty of a misdemeanour." Now, the circumstances of the case are these: One of the parties charged had been the whole life and soul of the Company; it being admitted by all parties that he was the "soul" of the Company, and that he had been very active and exertions, and by pledging his credit with coal merchants and others, raised the Company from the lowest state of depression to a state of great prosperity. I believe all parties agree that this could not have been done had it not been for the services of the Chairman of the Company. He was a man of great energy and ability, and he was very anxious to have followed the profession of a doctor; but he left this profession and devoted himself to managing the Gas Company, and gas was supplied to him without a meter during the years he has been the Chairman of the Company. No charge for this gas appears in the Company's books, but it is a fact that the Company was kept in a state of great prosperity, and that the question appears to have been raised about the matter, and hence the present charge. With regard to the Deputy-Chairman, he had a supply by meter, and upon going to live in the neighbourhood of the works, he spoke to the Company's collector, or the person who had charge of the meters, and said, "I am told the residents of the Company have gas supplied to their flats, but, nevertheless, I will have a meter," and accordingly, a meter was put up, which meter was examined every quarter regularly for

seventeen quarters, and the account was taken just the same as it would have been in the case of any other consumer. The Deputy-Chairman paid, like any other customer, for the coal and coal he bought of the Company, but it appears that as regards the gas which was burnt in his house, no charge was made, owing to the word "open" having been written upon the counterfoil of the meter register book, in consequence of the conversation I have referred to; the word "open" being a direction to the collector that it was not to be charged, and that the Deputy-Chairman, being a resident Director, was not expected to pay for his gas. Now, it appears that two gentlemen—the prosecutors—subsequently became Shareholders in the Company, and there is a suggestion that they earnestly desired to join the management—to become Chairman and Deputy-Chairman—and there seems to be some ground for this suggestion. Those gentlemen happened to find out about the free supply of gas to which I have referred, and having complained of it at the next meeting of the Company, the Chairman gave an account of his connection with the Company. The Deputy-Chairman also explained the circumstances, saying that the register of the meter had been taken, and that the gas which had been consumed. The feeling of the Shareholders at the meeting was very strongly in favour of the Chairman and Deputy-Chairman, as they seemed to think no fraud had been intended; but that will be a question for you to decide. These gentlemen are charged, as Directors, under the seal of the Act of Parliament which I have just read to you. The question will be, whether the acts of the defendants were not done, to use a mild phrase, under a misconception, and whether they were done without any fraudulent motive. The evidence is that the defendants were resident Directors of the Company, and that the defendants were in the management of the concern, and for these services the supply of gas was not to be charged to them as to ordinary customers; but this will be a point for you to consider. As to stealing the gas, I cannot see that there will be any case at all, because the gas was laid on by the Company's servants. It is not likely that a fraudulent removal of a meter, if a person has a right to use the gas, and the Company supplies the gas passes through it, and the person diverts the gas by using a curved pipe, so as not to allow the gas to go through the meter, then no doubt the person so acting is stealing gas; but here the gas was laid on and supplied by the Company, it is known to be a fraudulent removal of a meter, and the question can arise under the section of the Act of Parliament which I have read to you. If you are satisfied that, from the beginning to the end, there was no fraud intended by these gentlemen it is not right that they should be put upon their trial; and if you are of opinion that it is not the case which should be inquired into by a petty jury, you will say so.

If a person has a right to use the gas, and the Company supplies the gas passes through it, and the person diverts the gas by using a curved pipe, so as not to allow the gas to go through the meter, then no doubt the person so acting is stealing gas; but here the gas was laid on and supplied by the Company, it is known to be a fraudulent removal of a meter, and the question can arise under the section of the Act of Parliament which I have read to you. If you are satisfied that, from the beginning to the end, there was no fraud intended by these gentlemen it is not right that they should be put upon their trial; and if you are of opinion that it is not the case which should be inquired into by a petty jury, you will say so. The meeting of Shareholders was satiated with the reading of the bill in one case having long ago been paid, the matter is one which might very well have been allowed to end after the meeting; but if you are of opinion that it is not likely, under the circumstances, that any jury would find these gentlemen guilty of fraudulently misappropriating gas, you will not put them upon their trial.

WEDNESDAY, AUG. 4.

The Grand Jury this day returned "No true bill" in any of the counts of the indictment against either of the defendants.

Miscellaneous News.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

The Nineteenth Annual Meeting of this Association was held in the Academy Hall, Perth, on Thursday and Friday, the 8th and 9th of July, under the presidency of Mr. J. Ross, of Haddington.

THURSDAY, JULY 8.

The President having taken the chair, The Secretary (Mr. David Terrace) read the minutes of last year's meeting of the Association, held in Edinburgh, as well as of the several meetings of the General Committee during the year, and they were approved.

ADMISSION OF NEW MEMBERS.

The following gentlemen were admitted members of the Association:—

ORDINARY MEMBERS.

Blyth, T.	Kettle.
Carmichael, J.	Kierriemuir.
Marshall, W.	Brechin.
Wilson, E.	Stonehouse.

EXTRA-ORDINARY MEMBERS.

Bray, G.	Leeds.
Briggs, W.	Arbroath.
Donald, D.	Johnstone.

ELECTION OF OFFICE-BEARERS FOR 1890-81.

Messrs. Alex. Donaldson (Edinburgh) and R. Hall (St. Andrews) were appointed Scrutinizers to examine the ballot-papers, and they subsequently reported that the following gentlemen had been elected Office-bearers for the ensuing year.

President—James M'Gilchrist, Dumbarton.
Vice-Presidents—William Mackenzie, Dunfermline; Thomas Whimster, Perth.

Secretary and Treasurer—David Terrace, Arbroath.

Committee—G. R. Hislop, Paisley; Alex. Mitchell, Dundee; Samuel Stewart, Greenock.

Auditor—D. Bruce Peebles, Edinburgh.

It was agreed that the place of meeting next year should be Glasgow.

PRESIDENT'S INAUGURAL ADDRESS.

The President then said: Gentlemen,—It has fallen to my lot at this time to be called upon to occupy the position of President of the North British Association of Gas Managers, and I cannot allow the opportunity to pass without thanking you for the honour conferred thereby, not on me only, but at the same time on those members of the Association who, like myself, manage the smaller class of gas-works in Scotland. I look upon myself as a representative man, and have no desire to monopolize this honour, but will willingly share it with all those who, like me, have been immensely greater than my own. From my long experience as a Manager, I hope you will bear with me while I indicate a few points which may be of use to some of my younger brethren. To those of them

who have just entered the profession, and taken upon themselves the duties of a manager, I would say: Do not be in a hurry to change your situation, rather settle yourselves down to work, and endeavour to gain that experience which time alone can give. You will thus gain a character which will render you a formidable competitor when a favourable opportunity arrives for improving your position. When the mind is continually on the alert, watching for an opening, it has a tendency to cause us to lose sight of the duties of the duties of the manager. My purpose, leads us in the end farther from the object of our desire. As I have said before, do not be given to change; strive to gain the confidence of your directors and consumers, and by-and-by, like myself, you may find it altogether unnecessary. Peace of mind is of more value than great riches.

Coming in the next place to speak of coal, you will find me very conservative on that subject, having many years ago fixed upon a standard for my own working, to which I have rigidly adhered, constantly using coal from the same collieries and from the same seams, and thus I am enabled to approximate closely to the quantities of each kind required to produce the quality of gas with which it is intended to supply our consumers. In this way you may arrive at an easy mode of conducting small gas-works, and have no necessity for constantly testing the numerous kinds of coal which are presented to your notice. Purification is also effected with greater certainty, and I have found it to be necessary, on changing a purifier, to enter the date, the index of the meter, and the quantity of gas passed through.

In connection with coal, I would remind my younger brethren, to whom I am now addressing myself, that it is of the utmost importance to have a good knowledge of the position of the various seams of parent coal which are daily offered for our acceptance. The seams of parent coal are not so numerous as the names by which they are called; for although the same seam is wrought by one man on one side of a fence, and by another man on the opposite side, yet these coals are presented to us under names "as if they were different." It is not so, but we must not be misled by the appearance of the coal, and the geological position of the seam, the district from which the coals are said to come, we are very apt to feel ourselves in the position of the man who buys "a pig in a poke."

To those members who have not the advantage of immediate proximity to a coal field, there are many valuable and instructive works, and a vast amount of knowledge on those subjects may be obtained. I need only mention the valuable series of maps of the Geological Survey of Scotland, and the memoirs accompanying the same; also a valuable series of prize essays on the Geology of Scotland, published by the Highland and Agricultural Society, and embracing nearly all the counties of Scotland.

The retort-house claims a large amount of attention, and in my opinion it is of the first importance, being the principal place where the money is earned. Without careful supervision over all the operations conducted therein, you will find that your difficulties will be neither few nor light. Good, honest, and steady workmen also are indispensable to the comfort of a manager in a country, and when a manager wishes to obtain men of this description, he should be kind and considerate to them, and should not lightly part with them.

Outside the works, as you all know, the duties of a manager are highly onerous. The main services required great attention, especially on those lines of communication subject to the traffic of road vehicles, the wheels of which crush through the service-pipes, particularly in streets where there is only a main on one side. Escapes should be at once attended to, so that all risk to life or property may be avoided.

Meters claim a large share of our attention; and having had the inspection, watering, and cleaning of all our meters for a period of more than 30 years, and having done this work unassisted, I may claim your forbearance when I state that I ought to be able to speak confidently as to the following results of my experience with the various kinds of meters which have come under my observation. I have found that, on an average, and with sizes of pipes as are to be found in Haddington, ranging from 3 to 5 lights, require in a period extending from the 15th of May to the 15th of November, 12 cubic inches of water to adjust them properly, and from the 15th of November to the 15th of February, 18 cubic inches, and from the 15th of February to the 15th of May, 8 cubic inches, amounting in all to 28 cubic inches of water per meter per annum, a quantity requisite to supply a 3-light meter for a year. I have attained this result from carefully noting the number of gallons of water required during the course of each survey, and you may perhaps feel a little astonished when I tell you that I have in the course of these surveys distributed nearly 900,000 gallons of water.

There may be some here who are anxious to know my opinion as to the merits of the various meters which have come under my observation; but I wish it to be distinctly understood that I purposely refrain from making a comparison between the meters of either one maker or another. The meters with which I have had to do, are, in my opinion, wonderfully perfect instruments. All meters work well if properly attended to; but as well as we may expect a steam-engine to do its work without being supplied at stated periods with water and fuel, as look for a gas-meter working correctly when it is not attended to at regular intervals, and no care taken to see that it is properly adjusted with water. My experience leads me to believe that it requires more skill and a better acquaintance with the internal mechanism of a gas-meter than is generally possessed by ordinary inspectors before we can expect the full advantages to be derived from the use of such correct and beautiful instruments of measurement.

When we consider, as I have done, the enormous quantities of gas which our meters to inspect, I make no secret of the desire I feel to possess a good and reliable dry meter; and in this desire I am sure I shall be upheld, in the opinion of all those who know what it is to face an inspection of wet meters, with all its disagreeable concomitants. I am glad to see that some of the largest cities in Scotland are adopting the use of the dry meter, and to a large extent, adopting dry meters in preference to wet ones; and the encouragement thus given to manufacturers will, I hope, stimulate them to improve and perfect the dry meter until it becomes the only meter on which all of us may with confidence rely.

In looking over our Transactions for several years past, I am astonished at the number of so-called inventions and improvements in gas manufacture, and machinery connected therewith, which have been offered for our acceptance, and been urged upon us with much eloquence and many weighty reasons, and yet you all know that few, if any, of them are ever taken into consideration. Whether this arises from apathy to the interests of our profession, or from that intuitive faculty which it is said we Scotchmen possess in a remarkable degree—I will not say of "seeing through a millstone," but rather of seeing at a glance the real value of anything that is placed before us, I will leave some one else to determine.

There is one thing, however, which we cannot overlook, and that is the bold flight of our modern gas engineers in an upward direction. We have seen scrubbers towering above all other buildings in gas-works, and we shall shortly have an opportunity of beholding a gasholder, when filled with gas, soaring to the amazing height of 168 feet; we may well ask, what next. Some one will say, "The time is coming, when the gasholder, which I think we are far from seeing the realization of the hopes of those persons who have embarked their fortunes in the production thereof. Yet we need not

shut our eyes to the fact that an intense and a brilliant light can be produced, which may be used to great advantage in some situations; and although I believe the light of the time is far distant when it will take the place of gas in domestic illumination, yet I am convinced that when the necessity arises for its adoption, Science will be able to overcome the difficulties with which the subject is now surrounded.

Within the past two or three years it has struck me forcibly that, as gas managers, we ought to be the right of the primary object of our profession—viz., the production of illuminating gas, and have been drifting away in the direction of becoming manufacturers of the secondary or residual products thereof. I am led to this conclusion from the prominence which is given to this subject at all the meetings of our Associations, and from the multiplicity of machinery which has of late years been patented for the purpose of enabling us to enter into the trade. Almost daily we have our attention called to some washer or scrubber newer and more efficient than any other which has preceded it, and at the benefits resulting from the use of these improved appliances are really as great as they are represented to be, so to not see how any one can reasonably delay their adoption. As ammonia is becoming such a valuable article of commerce, it may become a question with gas managers how far the amount of this substance contained in a coal should enter into their calculations when making a contract for their yearly supply. The quantity of ammoniacal liquor, and its strength, have not hitherto formed items in the results obtained from a ton of coal in the analyses sent to us (with the exception of a very few); but I expect it will take a more prominent place in all future analyses. My only fear is that coal merchants will not be slow to take advantage of the additional value conferred on the article in which they deal, and add to the price of the coal according to the quantity of ammonia contained therein. At the same time, the effect of the quantity of ammoniacal liquor contained in a ton of coal, the following is a sample:—

Muirkirk	14.00 gallons
Staurig	9.90 "
Foulden	24.15 "
Shotts	9.06 "
Ponfearh	31.00 "

Allow me to apologize, gentlemen, for trespassing so much on your time and patience. I only now remains for me to call your attention to the very interesting list of names and communications, the titles of which you will find in the programme.

On the motion of Mr. D. BRUCE PEEBLES (Edinburgh), a vote of thanks was passed to the President for his address.

ADITOR'S REPORT.

Mr. PEEBLES then read his report on the state of the finances of the Association; and this being considered satisfactory, was adopted.

The reading of papers and communications afterwards commenced, and these were taken in the order appointed by the Committee.

Mr. J. ANDERSON (Leven) read the following paper on

MECHANICAL SCRUBBERS.

When your Secretary asked me to write a paper for this meeting, I began to consider what subject connected with the manufacture of gas could one, who had for several years laid aside the responsibilities of a gas manager, hope to make interesting and profitable to gentlemen, but, like yourselves, actively engaged in that manufacture, and whose professional opportunities for observation were certainly far more abundant than his own. The only subject I could think of was that of "Scrubbers," and, more especially, "Mechanical Scrubbers," with the introduction and construction of which I have but a small amount of experience. Indeed, this paper cannot pretend to be an exhaustive treatment of the question, and should rather have been styled "A few rough notes concerning such mechanical scrubbers as have come under my own observation," and in giving you these rough notes I do not wish to be considered as puffing up one scrubber more than another, or as displaying any special partiality to you, as clearly as possible, their construction and principle of action.

In the early days of gas manufacture, when managers troubles were fewer, or at least less complicated—directors, shareholders, and consumers less exacting—the working plant of a gas-works was very simple indeed. The condenser, the purifier, and the washer, were the only machines, and the destructive effects of ammonia and other impurities in gas which escaped the action of the lime purifier began to show themselves on a growing scale corresponding to increased consumption, steps had to be taken to remedy these evils. This led to the introduction of the washer, and when this proved unmanageable on a large scale, on account of the great back pressure, and other troubles of the kind, scrubbers filled with coke, bricks, wooden boards, tiles, furze, and other substances presenting a number of rugged surfaces, which were kept wetted by a copious supply of water run in at the top, and distributed by various contrivances more or less ingenious. The gas entering at bottom was supposed to be divided into as small and numerous streams as possible, and to come intimately in contact with the water, which, by its superior affinity, robbed it of its ammonia, and it passed out at the top in a pure state as far as ammonia was concerned; the water being drawn off at bottom in the form of weak ammoniacal liquor. As long as a large quantity of water was employed, this was not a serious matter, and the gas, as it were, to observe, a liquor of little commercial value. The great demand for sulphate of ammonia, however, induced the strengthening of the liquor by re-pumping, and passing it over and over again through the scrubber, until a salable strength was obtained. This, however, caused the gas, at its issue from the scrubber, to be saturated with the water, and to carry away with it traces at least of ammonia, and often a good deal more. This re-pumping had also the effect of fouling the scrubbing material, and, as many of you know to your cost, the changing of the material became a very dirty process, and could only be done by throwing the scrubber out of action, and there being only one scrubber in use, however, coal must become in the course of the winter's work. The re-pumping, too, having in small works to be done by hand, was a laborious business. These defects have led to the heightening of the column of scrubbing material—to the erection of those formidable towers, which overshadow so many of our large gas-works. These towers, no doubt, do suffer from the same evils, and the water entering at top becomes converted into liquor of 6° to 8° strength on issuing at the bottom, and the gas issuing at top is practically free from ammonia; but there is, of course, the pumping of the water in most localities to their great height, and what must come in time, the removal and renewal of the coke or other scrubbing material. These drawbacks have led engineers to devise some means whereby the scrubbing material could be constantly washed clean from ammonia, and immediately presented freshly wetted to the gas, divided into very minute streams—could, in fact, be constantly revived, and could also, while yielding strong action, be so constructed as to suffer from the same evils only come in contact with the issuing stream of pure gas—pure, at least, as far as ammonia is concerned.

One of the earliest of these machines, though not primarily intended as a mechanical scrubber, was the rotary exhauster of Mr. Whimster—a member of your Association—in whose works here one may be seen still

doing good work, though becoming unable to cope with the greatly increased use of gas since it was erected. This consists of a cylindrical vessel filled to the top with water, and the water is drawn off by a pump works a scoop drum with vanes or scoops arranged in radial curves. The case is divided by two dip partitions into three compartments. The centre compartment contains the scoop drum, and is in communication with the condenser and hydraulic main, the two end compartments communicate with the water in the tank. The drum being revolved by a hand wheel, the water is drawn or scooped into the inside of the drum, carried down to its centre, where it finds its exit by bubbling up through the water into the two end compartments. This is more truly a mechanical washer than a scrubber, but it has this in common with the mechanical scrubber, that it presents the freshly-wetted surfaces of the radial passages to the contact of the gas divided into moderately small streams. Perhaps Mr. Whimster may be able to give us a few details in regard to his machine, which, no doubt, will be interesting to us all.

Another mechanical scrubber was also invented by a member of your Association—Mr. John Reid, of Leith, and as has kindly been sent me a description of it, I will take the opportunity of bringing it before you. Though I dare say many of you have had an opportunity of seeing it in action at the gas-works at Leith, where it was introduced in 1865, and is still in full action. This apparatus consists of a close cast-iron cistern, divided into two equal chambers by a longitudinal vertical partition, in each of which chambers revolves a hollow cylinder, the periphery of which is composed of cast-iron buckets in the manner of a water-wheel, except that the outside of the buckets is enclosed, and the inside perforated with a great number of holes ¼-inch diameter. The cistern is filled with water to 2 or 3 inches above its centre line, and the cylinders, which are turned by a hand wheel, revolve in opposite directions, and pass into the centre of the first cylinder, passes through it under a dense shower of finely-divided spray, and on reaching the end is carried by a cross passage into the centre of the second cylinder, where it receives similar treatment, and is delivered at the front of the machine perfectly free from ammonia. This has been taken up by Mr. Reid, and is gradually brought up to any required strength—say 10°. The machine requires very little power to drive it, and is most effective; but the gas is not subdivided thoroughly, as in some others of later date, and with the quantities required to be dealt with in our large works the machine would not be so well adapted for use as the one I have just described, passing through in large bulk without coming into contact with the water.

Another of the early mechanical scrubbers was one invented by Mr. Still, of the Chartered Gas Company, London. It consisted of a long cylinder laid on its side, and having a shaft passing through it horizontally, arranged to revolve, and having a pair of horizontal arms, one on each water and the pans caused to revolve, a cloud of spray was raised, through which the gas passed from one end of the cylinder to the other. This machine, besides requiring great power to drive it, did not divide the gas into small streams, and thus lost much of its useful effect.

The machine which I have just described, I first saw in the notice is Anderson's Brush Scrubber, invented some five or six years ago by Mr. George Anderson, of London. In this machine the gas, where there is any doubt of its being imperfectly condensed, is first passed through a washer, made on his well-known principle with serrated ledges, so that any light tar or oil which may remain in the gas is arrested, and the gas then passes into a chamber in which ammonia is used to wash the gas. The chamber in which revolves a cylinder covered with Piassava fibre—a substance which is practically indestructible, and is secured to the cylinder in a mode that renders its getting loose almost impossible. The gas then ascends into the next chamber, and so on until it issues from the last chamber perfectly free from ammonia. During its progress it has also parted with a large quantity of carbonic acid and sulphuretted hydrogen, and thus the lime purifiers are relieved of a considerable amount of work, in many cases saving from 30 to 40 per cent. of the lime usually required per ton of coals carbonized. The brushes being used in the opposite direction to that of the ascending gas, thoroughly break up the gas, and bring it intimately in contact with the liquor. The brushes being half immersed in the liquor, carry a large quantity with them, and present clean and freshly-wetted surfaces to the gas at each revolution. These machines are very easily run, and, as the gas is not saturated with water, there is no friction, the brushes passing through the water to be overcome. Pure water above, at the rate of 10 gallons per ton of coals carbonized, is run in at the top, and as this is all that comes into contact with the gas, the illuminating power suffers little if any deterioration. The dread of lowering the illuminating power of the gas, which is the chief objection to the use of these machines, amongst managers of Scotch gas-works, and has, no doubt, stood much in the way of the introduction of scrubbers. There may be some foundation for it when large and copious streams of water are used, but the small quantities introduced into these scrubbers can, I think, have no prejudicial effect whatever. In regard to this, however, I would be glad if any of your number who has had practical experience of the working of these scrubbers would give us the results of his observations, as, though I had a small one at work all last winter in our own small gas-works, I have had no facilities for photometrical observation.

The machine which I have just described, the one most recently invented one, is the "Standard" Washer and Scrubber, invented and brought out by Messrs. Kirkham, Hulett, and Chandler, of London. This consists of a cast-iron case divided into compartments, each compartment communicating with the next by a hole in the centre of the division-plate. A horizontal shaft passes into each compartment, and carries a number of discs, one for each compartment. These discs are composed of a cast-iron centre portion, one side open like the arms of a wheel, and the other fitting closely to the shaft, and allowing no gas to pass. To each side of this is riveted a wrought-iron circular plate, extending to within a short distance of the open end of the case, and between these two plates filled in with a great number (from 60 to 120 layers according to size) of very thin (No. 27 B. W. G.) sheet iron. These sheets are covered all over with dimples 3/32nd-inch high, so arranged as not only to act as distance pieces, to keep the sheets apart, but also to break up the gas into innumerable small streams. The case is filled with water to a certain height, but 1 inch lower in each compartment, thus providing that the flow of the liquor will always be in an opposite direction to that of the gas. About 10 gallons per ton of coal carbonized is run in at the high end, and, as gradually, the gas is changed to ammoniacal liquor of 6° to 7° strength, according to the character of the coals carbonized. The gas from the condenser being admitted at the low end, as I may term it, though the case is really level, passes first into an empty chamber, then through the centre of the division-plate into the next compartment, and so on, until it has passed through all the compartments, and its way out to the periphery of the disc through the vacant spaces between the dimpled sheets. The shaft carrying the discs has a slow motion, about four revolutions per minute, imparted to it from any suitable motor, and thus constantly presents clean and freshly-wetted surfaces to be in contact with the gas. After the gas has passed through the last compartment, it comes to the centre of the next disc, and so on until it emerges from the last

disc perfectly free from ammonia, and having, as in Anderson's scrubber, parted with a large amount of carbonic acid, and also sulphuretted hydrogen. Little or no resistance is presented to the passage of the gas, and the power required for working the scrubber is very little, as the discs are completely balanced, and there only remains their friction through the water to be overcome.

And now many of you will be ready to ask, What is the benefit of using these really simple, though perhaps some of you may think complicated and too delicate machines for use in gas-works?

1. A gas perfectly free from ammonia. In regard to this great advantage I need say little, as you are all in a position to appreciate this better than I can explain it. The increased durability of your meters and other fittings will alone repay you, and the freedom from complaints from customers of stopped fittings will also be found a great relief. In all the experiments mentioned on the tables I have here, you will see that no ammonia escapes the action of these scrubbers.

2. A great saving in time and consequently labour (the time not requiring to be so often renewed) in the case purifiers. And I may notice under this head increased comfort to the men, as they no longer have the

carbonic acid to contend with when changing the purifiers, which has often produced dangerous results well known to you all.

3. An increase of the quantity of ammoniacal liquor for sale, at the rate of 10 gallons per ton of coal carbonized, and, as you will see from the accompanying tables, of from 6° to 10° strength, depending on the character of the coals carbonized. Table No. 1 gives the result of experiments made in the purifier with a scrubber passing about 250,000 cubic feet in 24 hours. And in all except the last test, when the water was purposely shut off, the gas issuing from the outlet was perfectly free from ammonia. Table No. 2 is a test in ordinary working at the gas-works, Vauxhall, London, from a scrubber passing 500,000 cubic feet per day, and giving perfectly pure gas, as tested by a constant lime test. Table No. 3 is a similar table showing the result of the working of one of Messrs. Kirkham, Hulett, and Chandler's "Standard" scrubbers passing 60,000 cubic feet per hour, and yielding gas perfectly free from ammonia, and 10 gallons of liquor of 11 to 13 oz. strength per ton of coal. Table No. 4 also shows the same result, with at the same time an analysis of the gas, showing that in its passage through the scrubber it has not only parted with all its ammonia, but also with one-fourth of its sulphuretted hydrogen and carbonic acid.

TABLE No. 1.
Gas-Works, Waterford.

Place of Test.	Gallons of Water run in per Ton of Coal.			
	Twelve Gallons.	Eleven Gallons.	Ten Gallons.	Water stopped to Increase Strength.
	Onuces. 12 5/10	Onuces. 10 5/10	Onuces. 10 5/10	Onuces. 10 5/10
Bottom box	11 8/10	14	15 2/10	17 6/10
First brush	4 6/10	5 4/10	7 4/10	13 4/10
Second brush	1 2/10	1 2/10	1 2/10	1 2/10
Third brush	0 3/10	0 4/10	0 5/10	2 1/10
Fourth brush	—	—	0 1/10	Not tested.
Fifth brush	—	—	—	—

TABLE No. 2.

	Onuces.
Bottom box	9
First brush	8
Second brush	3
Third brush	Trace.
Fourth and fifth brushes	—

TABLE No. 3.

Nos. of the Divisions and Strength of Liquor in each.										Water Used per Ton of Coals		Gas Purified per Hour.		Ammonia on Outlet.		Temperatures.			Pressures.		Revolutions per Minute.	
1879.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	Inlet.	Outlet.	Atmosphere.	Inlet.	Outlet.	In.	Out.
Jan. 7.	Onuces. 11	Onuces. 9	Onuces. 7	Onuces. 5	Onuces. 3	Onuces. 1	Onuces. 1	Onuces. 1	Onuces. 1	Onuces. 1	Galls. 10	Cub. Ft. 30	Nil.	74°	66°	31°	25°	23°	25°	23°	5	5
" 8.	9	7	5	3	1	1	1	1	1	1	10	30	61°	74°	67°	33°	27°	25°	23°	25°	4	4
" 9.	11	9	7	5	3	1	1	1	1	1	10	30	61°	74°	67°	33°	27°	25°	23°	25°	5	5
" 10.	10	8	6	4	2	1	1	1	1	1	10	30	61°	74°	67°	33°	27°	25°	23°	25°	5	5
" 11.	12	10	8	6	4	2	1	1	1	1	10	30	61°	74°	67°	33°	27°	25°	23°	25°	5	5
" 12.	11	9	7	5	3	1	1	1	1	1	10	30	61°	74°	67°	33°	27°	25°	23°	25°	5	5
" 13.	13	11	9	7	5	3	1	1	1	1	10	30	61°	74°	67°	33°	27°	25°	23°	25°	5	5

TABLE No. 4.

Gas passing Hour.	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolutions of Apparatus per Minute.	Nos. of Divisions and Strength of Liquor.										Water Used during Experiment.	
	SH ₂ .	CO ₂ .	NH ₃ .	Washer.	Air.			10.	9.	8.	7.	6.	5.	4.	3.	2.	1.	Galls.	
Cub. Feet 64,000	Inlet. 2'00	2'00	Grains. 138	72	57	21	41	Twad. deg. at 60°	5'3	4'9	2'5	2'35	1'7	1'05	0'6	0'3	0'15	0'1	63
	Outlet. 1'50	1'50	0'8	68	57	20	41	Acid, ounces.	11'0	8'4	6'3	4'5	2'7	1'7	1'3	0'7	0'3	—	—

These are valuable results, not only in a chemical but in a commercial point of view. I have been in correspondence with manufacturers of sulphate of ammonia, and have obtained from them very conflicting estimates of the value of ammoniacal liquor of different degrees of strength. One maker writes, that assuming the liquor to be of the degrees of strength indicated below, the prices realized would be as follows:—

Liquor of 3° strength, = 2s. 0d. per 100 gallons at gas-works.

" 4°	"	"	"	"	"	"	"
" 5°	"	"	"	"	"	"	"
" 6°	"	"	"	"	"	"	"
" 7°	"	"	"	"	"	"	"
" 8°	"	"	"	"	"	"	"
" 9°	"	"	"	"	"	"	"
" 10°	"	"	"	"	"	"	"
" 11°	"	"	"	"	"	"	"

From the above table it will be apparent that at 3° the liquor is worth 8d. per degree, and at 6° it is worth 1s. per degree per 100 gallons. Gas-works carbonizing 4000 tons of coal per annum without scrubbers will make about 80,000 gallons of liquor of 4° strength, worth £133 6s. 8d.; but by adding a mechanical scrubber, an additional 40,000 gallons of liquor of 8° strength will be made, which being added to the 80,000 will make 120,000 gallons of 5½°, worth £230, or a gain of nearly £190. This, I think, a high estimate, but the actual prices paid in London last year per but of 108 gallons of ammoniacal liquor were—

For 5-oz. liquor, of about 2½° Twaddell	4s. 6d.
" 6-oz. "	5s. 5d.
" 7-oz. "	6s. 4d.
" 8-oz. "	7s. 3d.
" 9-oz. "	8s. 2d.
" 10-oz. "	9s. 1d.

or at the rate of about 1s. 10d. per degree, and you can easily understand that where the carriage of the liquor to makers works comes into operation, the value of the higher degrees increases rapidly.

From the foregoing figures you will see the value that ammoniacal liquor has attained of late years, and also the absolute waste that takes place when the ammonia is allowed to go forward with the gas to the dry lime purifiers, or, worse still, to the consumers' houses. And I hope these remarks may be the means of directing the attention of such of you as have not already gone into the question to the importance of gas-works of scrubbers, and where facilities exist, of mechanical scrubbers.

Discussion.

Mr. WATSON (Stirling) said he had had a little experience with Mann and Walker's scrubber, having worked one for about three years. The result had been a great saving to his Company in the way of lime for purifying; last year their lime account did not amount to 5d. per 1000 feet of gas made. He had had his ammoniacal liquor up to 15°, and had not found the illuminating power of the gas was affected by the washing necessary to accomplish this.

Mr. A. MACPHERSON (Kirkcaldy) said he could most emphatically bear

out all Mr. Anderson had said regarding the importance of good scrubbers. He had one of Anderson's Brush Scrubbers erected at his works two years ago; and after two winters experience he could say it was a most efficient apparatus, and had been the means of very materially reducing the purification account. Mr. Anderson said he had reports from some sources of a saving of 30 to 40 per cent. of lime. In his (Mr. MacPherson's) case he calculated it had been a saving of from 25 to 30 per cent., and like Mr. Watson, he found his purification at present to cost something like 1d. per 1000 feet of gas made. The saving in lime more than paid the interest on the capital expended on the scrubber, and the extra price received for the improved quality of the liquor had already repaid even the capital expended. He introduced the pure water at the top brush at the rate of 10 gallons per ton of coal carbonized, and at the overflow from the washer he obtained a liquor which averaged 10° Twaddell, and by merely reducing or increasing the water supply he could get the liquor of any required strength. He had found that, when passing about 270,000 feet of gas per day, the ammonia was almost entirely removed at the outlet of the third brush, leaving two brushes in reserve in case of any accident. He had never found the illuminating power of the gas to suffer in the least from the use of the scrubber. This might be attributed to the fact that the gas was introduced into the bottom box among the strong liquor, and was gently passed from brush to brush, always meeting weaker liquor as it ascended, and only in the last brush would it meet pure water, which was supposed to have an injurious effect on the illuminating constituents of gas. One of the objections raised by some persons to this scrubber was the power required to drive it. He found, moving as it did at such a slow rate of speed—two to three revolutions only per minute—that the power required was practically nil. Another objection raised to it was that the tar might get in and clog up the brushes. He had not found this to be so. He found that the washer attached to the bottom of the scrubber arrested any tar that might pass the condenser. But even supposing tar were to pass into the brushes, he thought by the introduction of some naphtha into the top brush, and allowing it to flow from brush to brush, it would entirely remove any tar from the brushes. In conclusion, he strongly advised the introduction of some kind of scrubber into all works.

Mr. PEARLES said he had the usual feeling of Scotchmen in thinking that everything good came from their country. As regarded Anderson's scrubber, he thought he might safely claim it as the invention of a Scotchman, and so far as the efficiency of its work was concerned, this had been well testified by Mr. MacPherson and Mr. Reid's invention. When in London, however, a few weeks previously, he mentioned the circumstance to Mr. Kirkham; and that gentleman told him he had never heard of Mr. Reid's scrubber at all. So it must be acknowledged to be an English scrubber. The construction of the scrubber was very simple; it was quite accessible, was easily managed, and must require very little power to drive it. The height of Anderson's scrubber might be against it;

but the other, lying as it did on the ground, must commend itself to the members of the Association as being an admirable invention.

Mr. J. M'GILCHRIST (Dumbarton) thought the two scrubbers equally good—they were first-class. If there was any disadvantage in the height of Anderson's, it had the advantage of not demanding such large space for a foundation, and in gas-works—especially old works—this was of great importance. Because, as a rule, there was not much space to spare. Many of the engineers who designed gas-works, even so lately as 30 years ago, never dreamt of leaving sufficient space for scrubbers. He thought the reader of the paper, when he took up this subject, might have gone a little more fully into it. There was still another scrubber which had been recently patented and introduced, and was doing good work in gas-works in Scotland—namely, the scrubber invented by Mr. W. Young. It possessed a special advantage for small works, where power was not employed, which large scrubbers did not have. It resembled Mr. Anderson's scrubber in height, but in Anderson's there must be a certain flow of water proportional to the make of gas, and this required supervision. In Young's scrubber the chambers were all of sufficient size to retain, say, the quantity of water necessary for a day's manufacture, so that the manager could at any suitable time of the day, or at night, fill the top chamber, and at any time during the next day test to see if the liquor was of the strength required. If so, he could allow the scrubber to flow over, and all he had to do was to empty the under chamber, and by turning the water on to the top chamber it automatically re-charged itself. So it went on from day to day, and thus the manager had no trouble in regulating the quantity of water to the make per ton. Mr. Young's scrubber had been used in the works of the Edinburgh and Glasgow Co. in both places had proved very successful. They produced as nearly as possible 10 gallons of liquor per ton of coal, and that without any attention or mechanical appliance whatever. There should also have been mentioned the double scrubber which Mr. Brodie, of Paisley, erected at Dumbarton. It consisted of two chambers, each 12 ft. high, and divided by a cast-iron partition, with six trays in each division. This scrubber was filled with old brooms which had been used by scavengers, new ones not being quite so suitable. In connection with it there were two pumps. It had a large amount of surface, perhaps more than some of the new scrubbers, and it was doing good work, but it was not so good because of its simplicity, efficiency, and cheapness. The difference between the scrubbers shown and this one was that the mechanical power was used in the one case to actuate the scrubbing machinery, and in the other to raise the water.

Mr. W. MACFARLANE (Dunfermline) asked Mr. Anderson how much back pressure would be thrown upon the retorts, supposing there was a sudden stoppage of the mechanical arrangement in the brush scrubber.

MR. ANDERSON: Not more than half an inch.

MR. MACPHERSON: Suppose the duration of the stoppage to be ten minutes, the back pressure would be hardly anything.

MR. M'GILCHRIST (Dumbarton) asked Mr. Anderson, three years ago, two of Mann and Walker's scrubbers were erected, at a cost, he thought, of about £2000. They had been working eight months before the end of their financial year, and they then found the increased make of sulphate of ammonia warranted them in coming to the conclusion that in six years the scrubbers would pay for themselves. Mr. Anderson said that he could not say the same thing could be said of Anderson's and the other scrubbers named. In some cases it might be that ammonia could be detected after the gas left the scrubbers, but with Mann and Walker's scrubber there was not any ammonia at all detected. They seldom tested for it, and if they did it was only by means of a string, and that really no ammonia could get past the scrubbers in ordinary working. He thought a great deal of the efficiency of scrubbers lay in the amount of space set apart for the gas to settle in, so to speak. It took about seven minutes for the gas to pass through their scrubbers. A great deal, too, lay in the fact that they held the retorts close to the scrubbers, so that the gas could not get the ammonia. He should have thought that in the event of the machinery stopping there would have been a larger amount of back pressure than had been stated, seeing how the water stood above the divisions of the brush scrubber.

MR. WHIMSTER (Perth) said he had formed a very high opinion of Anderson's scrubber. It must be efficient, because there were no means by which gas could pass without coming into intimate connection with the water, and without being pressed upon a wetted surface. With regard to tower scrubbers, he might say that, in his earlier days of gas experience, he had only good to say with scrubbers of that kind, brooms, wire, and all sorts of things—some of them, sometimes, of the most broken material—and it was found to be fearful work cleaning them out annually. The smell was so offensive that it had perhaps prejudiced him very much against them. As had been mentioned, he had an apparatus that did a certain amount of work in scrubbing and washing, but to secure that no ammonia should pass on to the purifiers he erected about ten years ago a washer of very simple construction. It was a simple cylindrical vessel, 15 or 18 feet high, constructed with plates, each about 4 feet in height. The top plate was dome-shaped, and the other plates or shelves were made of cast iron, with 1-inch holes punched in them as thick as they could be made. The gas came in by a pipe falling right on the top of the dome. Fresh water was pumped to the top, and as it fell on the plates it met the gas coming up. The water splashed on the first, second, and third plates, so that there was a perfect shower, and any part of the gas passing up through the holes was immediately broken up into contact with the water. The gas was then washed, and ammonia was left in the gas after it passed through the machine. This was a simple and a cheap washer, and although he could not put it into competition with Anderson's, yet there must be a material difference in the cost.

MR. W. BROSCH (Aberroath) said that in all the gas-works with which he had business he strongly recommended the erection of scrubbers. The great difficulties which stood in the way were the first cost and the mechanical power required to work them. As was well known, a large quantity of gas was carbonized, and there was a great deal of cost and mechanical power on hand, and he therefore strongly recommended managers of such works to give special attention to Mr. Young's scrubber, which required no mechanical power.

MR. MITCHELL said that the Mann and Walker's scrubber they had been in active work for three years, and they had had no trouble in the flowing out of tar. There was as yet no difference between the outlet and the inlet of the scrubber, and so they had not had experience as to how much time it would take to clog them up. He did not think any small gas-works should have any difficulty in introducing a scrubber on account of the power, because gas-engines could now be plentifully had from one-man power upwards.

MR. W. YOUNG (Clippens) said there were a number of features essential to a scrubber, particularly for small works, where mechanical power could not be conveniently obtained; and even in large works where power could be obtained, and where there were great drawbacks to any form of machinery, where the scrubber was required to be constantly in motion to keep it in full operation. Should the mechanical scrubbers so fully described in the paper stop for any period of time, they

immediately fell out of action, whereas a scrubber properly constructed should continue in action for such a time as might reasonably enable any defect in or damage to the machinery to be rectified, and the whole set right before the scrubber should be entirely out of action. The arrangement which he proposed to describe in his paper was a very simple one, and it was of the nature of the essential of a scrubber for small works. At the same time it was applicable either to large or small works, but was eminently suited to the wants of the latter. It held a supply of liquor sufficient for some days; it totally abstracted the ammonia by the water once passing through it, requiring no pumping; it was self-regulating; it supplied its own water; it drew off its own liquor when it attained the proper strength; and further than this its moving parts were very simple, not liable to get out of order, and were actuated by the gas itself.

THE PRESIDENT said he was sure the members were all indebted to Mr. Anderson for his interesting observations. The subject would be very important in these days, when so much attention was being directed to the by-products of the manufacture of gas. He would point out, however, the curious similarity between Anderson's scrubber and one which existed some 33 years ago at the works with which he was connected. It was exactly in the form of a wheel, but it had only one row of plates. The wheel was filled with scavenger brooms. This scrubber was put up by the engineer who originally planned the works—Mr. Mark Taylor. At one time Mr. Taylor was in the Edinburgh Gas-Works, and 40 or 42 years ago he was appointed to Kilsno. He put up at Haddington a scrubber which was about 4 feet 6 inches in diameter, and was filled with old brooms, and round about it was a tank of water. A clean tank about 4 feet in diameter was placed in another house, which kept on working for about a week or a fortnight at a time. He (the President), however, did away with it when he was remodelling the works, as it was unequal to the quantity of gas which he was making.

MR. ANDERSON, in reply, said that he did not bring out all the details in two days, but he said at the outset that the subject of scrubbers was a wide one, and that he would merely be able to give the results of his own observations. Supposing the scrubbers were suddenly to stop, a little ordinary skill could supply a water-tank at a higher level, and this would keep up a constant flow of water, so that a power could be used to make the machine turn occasionally, so as to keep the brushes sufficiently wet.

LECTURE BY DR. MILLER, OF PERTH.

DR. MILLER, of the Perth Academy, at this stage of the proceedings, delivered a lecture upon "Heat: Its Mechanical Energy," for which a vote of thanks was accorded him.

An adjournment was then made for luncheon, and this afforded many of the members an opportunity of visiting (by the invitation of Mr. Whimster) the Perth Gas-Works, where, amongst other things, they saw the process of jointing pipes with Spence's Metallic Compound; a small size of Anderson's Brush Scrubber propelled by a steam-engine which also worked an exhaustor; and a two-man power Bisschop gas-engine.

(To be continued.)

BIRMINGHAM CORPORATION GAS AND WATER SUPPLY.

At the Meeting of the Birmingham Town Council on Tuesday last—the Mayor (Alderman R. Chamberlain) in the chair, reports were presented from the Gas and Water Committees.

The Gas Committee's report opened with a resolution accepting the resignation of the Right Hon. Joseph Chamberlain, M.P., as Chairman of the Committee, and a statement that Mr. Morris had been appointed in his stead. It then referred to the proposed erection of new offices for the gas department, increased accommodation being urgently needed for the staff and the consumers, and stated that the Gas Committee had agreed to certain proposals of the General Purposes Committee for carrying out this work. In reference to the relations of the Corporation with the Gas Companies, in connection with the gas supply, the report stated that the Gas Committee having failed to negotiate terms for the transfer to the Oldbury and Tipton Boards of the portions of the Corporation's gas undertaking within their districts, it was determined to proceed to arbitration. The purchase-money (£70,750) for the West Bromwich gasworks was duly paid, and the contract had been signed on the 1st of July, when the conveyance of the works to the West Bromwich Commissioners was executed. In reference to the general operations of the Committee, the report stated that contracts had been made for the construction of gasfitters' engines, £62,193; new retort-house, £18,888; exhausters, £550; gas-lights, £425; cooking-stoves, £38,900; and a new company, £20,000. Under the new contracts for tar it had become necessary to provide additional storage at the Salley, Windsor Street, and Alderley Street works. The Committee had therefore authorized the expenditure of £1706 for this purpose at Windsor Street and Salley. An action to recover penalties amounting to £800 having been brought against the Corporation by Edward Hopkins, brother of the plaintiff in the late action of *Hipkins v. Birmingham Corporation*, they had settled the claim by payment of £200. The Committee had made contracts for the purchase of 315,000 tons of coal for the year 1880-81, at about the same rate as last year. The new contracts had been made at a very favorable rate as last year. They were anticipated; and the Committee, being anxious to take the earliest opportunity of making a reduction in the price of gas, were preparing calculations which would, they trusted, show that such a reduction might be safely made from the 1st of January next. The sale of gas for the half year ended on the 30th of June, 1880, was 1,000,000 cubic feet in the corresponding period of the previous year, being an increase of 50,690,900 cubic feet, or at the rate of 3½ per cent. During the half year 70 official tests of the illuminating power of the gas had been made, the highest being 17.57, lowest 16.39, and average 17.15 candles, being about 15 candles in excess of the parliamentary standard. The number of new services laid during the half year was 511, against 450 in the corresponding period last year. The number of gas-fires supplied was 80; cooking-stoves on hire, 61; cooking and heating stoves, laid, 129. The whole of the yards had been kept clear of coke during the present summer. The stock in hand at the corresponding period of last year was 19,000 tons.

On the motion of Mr. MORRIS, seconded by Mr. J. E. BAKER, the report was adopted.

The Water Committee's report recommended the carrying out of certain works referred to in the report made to them by the Engineer (Mr. J. W. Gray), at a total estimated cost of £1300. The report also stated that in addition to the two sums of £5000 each, placed to the credit of the reserve-fund account for the years 1877-78, and £7000 in 1879, the Committee had transferred a further sum of £11,000 to the credit of the same account, making, with the accumulations of interest, a total of £29,799 18s. 3d. available for contingencies or for depreciation in the plant and machinery of the water department; in addition to which there was a surplus of £5416 1s. 4d. on the appropriation account.

In the course of the adoption of the report, Alderman AVERY referred to the subject of the revision of the water-rates charged by the Corporation. The Water Committee had, he said, been engaged upon this matter for

some time, and they proposed to submit to the Council returns of the water used by every class of house, of the various water-rentals throughout the town, the value, the number of persons, the trade purposes, and other information of a like nature, so that it might be seen how far the various charges made were equitable and just; and the Council having the facts before them, would then be in a position to properly consider the subject. He was very happy to invite the attention of the Council to the financial statement contained in the report, from which it appeared that the surplus for the half year ended June 30 last was nearly £5600, and the reserve-fund was £29,799, making together a sum of £35,000. The total amount of the reserve-fund the Council were entitled to accumulate was £30,000. It would be said, hereafter be for the Council to ascertain whether they had any surplus in this department, and whether that surplus should be applied as a contribution to the general rates or in diminution of the water-rates. All needful works for the improvement of the water supply were being carefully carried out.

Mr. Cook seconded the motion, and suggested that when the surplus came to be disposed of it should, in fairness, be applied to the reduction of the water-rates to the consumers.

The MAYOR said he must protest against the proposition that the whole of the surplus should be so applied. When the time came he hoped the Council would determine upon some appropriation which should take two directions—a contribution to the rates and a reduction of the charges to the consumers.

Mr. T. MARTINEAU said he should be sorry if the Council should decide upon any appropriation of the water revenues until the Committee had accumulated the full reserve-fund of £50,000, which was a comparatively small sum when they considered that the total property of the department was valued at £1,721,468. What they ought to do with reference to the revenue of the department, in the first place, was to take all the steps they possibly could to purify the water supply, and when they had done this they should apply any surplus, not in the reduction of the rates generally, but in the reduction of charges to the consumers. He trusted that when the Council came to deal with this question they would consider first the claims of the owners and occupiers of small houses.

ALDERMAN BAKER said some members of the Water Committee strongly sympathized with the opinion expressed by Mr. Cook, but at present he (Alderman Baker) thought it was better to have a rectification of the water-rates rather than a reduction in price. There was no doubt that, in the manner in which the rates were now levied, some people were unjustly affected.

ALDERMAN AVERY, in reply, said before any reduction in the water-rates was decided upon, ample provision would be made for giving to the borough an abundant supply of pure wholesome water.

The report was approved, and the Council passed to other business.

TAUNTON GAS COMPANY.

The Thirty-fifth Annual Meeting of this Company was held on Tuesday, the 27th ult.—Mr. W. P. PINCHARD in the chair.

The SECRETARY and MANAGER (Mr. A. J. Edwards) having read the notice convening the meeting, the regular reports of the Directors, and the accounts of the year's working, were presented.

[The report stated that the quantity of gas sent out in the twelve months ended June 30 had been 42,740,400 cubic feet, against 41,778,600 feet delivered in the previous year, being an increase of 961,800 cubic feet, or rather over 2 1/2 per cent. Key-hole tapping apparatus had been erected, and one of the gasholders was being enlarged to double its original capacity. Considerable extensions of mains had been made in various parts of the town, and land and property acquired to provide for future extensions of the works. The Directors recommended a dividend of 7 per cent. The general cash account showed that £687 8s. 6d. had been received from the Town Council for gas supplied to the public lamps; £5838 from private consumers; and £1568 15s. 4 1/2d. for coke, tar, &c. These items, together with the amount produced by two calls and the balance brought forward, made a total of £14,797 12s. 3d. Call, including carriage, had cost £3887 15s. 10 1/2d.; manufacturing wages, &c., £264 12s. 10d.; repairs and renewals at works, £269 5s. 6d.; repairs and renewals of meters, mains, and services, £446 2s. 11d.; rates and taxes, £370 11s. 10d.; salaries, £275; the other items, with a balance of £1739 15s. 3d., making up a total of £14,797 12s. 3d. The capital account showed that the amount received on shares had been £23,988; and there was a mortgage of £3036; leaving a balance due to income account of £1984 8s. 2d. The total expenditure on capital account had been £48,018 3s. 2d.]

The CHAIRMAN briefly moved the adoption of the report and accounts, and the declaration of the dividend recommended. In doing so he said he thought he might fairly congratulate the Shareholders on the success which the Company's operations in the past and previous years, and for this success he considered they were in a great measure indebted to the exertions of their Secretary and Manager.

Dr. KELLY seconded the motion. The increase in the consumption of gas had, he said, been very considerable, and the Directors trusted the Company's business would continue to progress favourably.

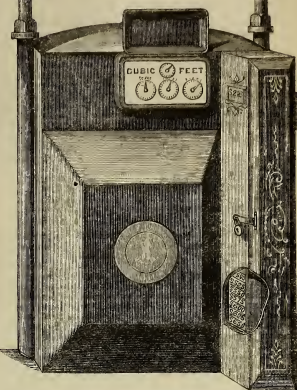
The report was adopted, and a vote of thanks was passed to the Directors for their successful management of the Company's business; the remuneration to be paid to them for their services being increased to £100 per annum.

The retiring Directors and Auditor were then severally re-elected, and after the transaction of some special business the proceedings closed.

THE PRICE OF GAS IN MANCHESTER AND LEEDS.—At the meeting of the Manchester City Council on Wednesday last the Mayor (Alderman Patteson) in the chair—Mr. Chesters-Thompson said he understood that the Leeds Corporation were now supplying gas to their customers at the rate of 1s. 10d. per 1000 feet. The Gas Committee of Manchester had decided that the Improvement Charge for the Corporation a sum of about £50,000 a year, but he found that the Manchester Gas consumer paid 40 per cent. more for his gas than the consumer in Leeds. He wished to ask the Gas Committee whether they had yet taken into consideration the question whether they were justified in charging 8s. per 1000 feet for their gas, while in Leeds the charge was only 1s. 10d.; and whether the present arrangement was satisfactory to the small consumer. Mr. Harwood, in reply, said the Leeds Corporation were supplying gas if not at prime cost, at perhaps a little less, and this was a policy which the Manchester Gas Committee did not think was sound. He thought it would satisfy Mr. Thompson to know that the gas in Manchester was as low a price as in any city in England, and that its illuminating power was as good as in most other places. Whatever money was paid over by the Gas Committee was appropriated in some way or other to the relief of the rates, and as the large profit was made the small consumer participated quite as much as the large. The question might be taken into account whether very large consumers should not have some consideration in price, and this question would, no doubt, shortly come before the Gas Committee. The subject then dropped.

A PRICE INDICATOR FOR GAS-METERS.

The *Scientific American* of the 26th ult. gives an illustration, which we reproduce, of an invention of Mr. Frederick Egner, of Norfolk, Va. It is for a price indicator to be attached to gas-meters, so as always to show, "in dollars and cents," the amount due for gas.



Our contemporary says of it: "A gas-meter is by no means a very difficult instrument to understand, yet the majority of gas consumers are unable to tell, by an examination of the meter, how much gas has been consumed, and the consequence is that disputes frequently arise between the gas manufacturer and the consumer, which might be entirely avoided if some means were provided which would enable the consumer to tell at any moment just how much is due to the manufacturer. The invention is very simple, and may be applied to meters already in use, or it may be made a part of a new meter. It consists of an endless band having printed on it figures, representing dollars and cents, advancing regularly in some fixed ratio. This band is mounted on two rollers in an auxiliary case attached to the meter case, and is driven by a simple train of gearing from the 'hundreds' pinion of the registering mechanism. The gas consumer may at any time know how much he is indebted to the gas manufacturer by noticing the figures visible through an opening in the case containing the endless band. The meter inspector carries a key to the case containing the band, and the latter may at any time be turned back to the zero point by loosening the lower roll; and should the scale of prices be changed, a new band may be supplied at a trifling expense. This invention is well calculated to settle many of the disputes arising between the gas consumer and the gas manufacturer, and it affords an effectual check on meter inspection, ensuring correct statement."

THE PURCHASE OF THE LINCOLN GAS-WORKS BY THE CORPORATION.—At the monthly meeting of the Lincoln Town Council, held on Tuesday last—the Mayor (Mr. F. J. Clarke) in the chair—the agreement entered into between the Lincoln Gas Company and the Corporation for the purchase by the latter body of the gas undertaking was brought up for sealing. The terms of the agreement had all been settled with the exception of one clause. The Corporation proposed that they should take a month for the payment of the dividends which would become due on the 1st of January and the 1st of July in each year; but the Shareholders thought that as they were going to hand over a large sum of money to the Corporation, they ought to pay the dividends when they became due. The agreement was to bear date July 26, 1880, and the Corporation would take the management of the gas-works on the 1st of July next year. The subject gave rise to some little discussion, but on the motion "That the agreement be sealed" being put, only two members of the Council voted against it, three remaining neutral.

FINAL MEETING OF THE NOTTINGHAM WATER-WORKS COMPANY.—The final meeting of this Company was held last Wednesday—Mr. R. Birkin in the chair. The Clerk (Mr. S. Maples) read a statement of accounts, from which it appeared that out of the funds remaining in the hands of the Company, there had been paid by way of compensation to Directors and Officers, £5170; to the Shareholders, £19,998 0s. 3d.; costs of management and winding-up, £250 5s.; remaining to be paid for final winding-up, £169 7s. 4d.—total, £28,687 16s. 3d., leaving a balance of £1312 8s. 7d. out of the £30,000 in the hands of the Directors at the meeting of the Company on the 5th ult. (See ante, p. 144.) This balance remained to be disposed of. Mr. Patchitt moved, and Mr. Lacy seconded, the following resolution:—"That in consideration of the eminent services rendered by the Chairman in the interests of the Shareholders, during the protracted and difficult negotiations between the Water-Works Company and the Corporation of Nottingham, connected with the transfer of the undertaking to the Corporation, the balance in hand, amounting to £1312 8s. 7d., be handed over to the Chairman by the Shareholders, as an acknowledgment of his services;" to which Mr. J. T. Brewster moved as an amendment—"That the balance now remaining, £1312 8s. 7d., monies received by the Company from the Corporation of Nottingham, be distributed among the several Proprietors of the shares of the Company respectively, and in proportion to their holding of the same." Mr. Green seconded this amendment; whereupon Mr. W. Taylor proposed, and Mr. W. Gibson seconded, a further amendment—"That a sum of £500 be paid to the Chairman, and that the remainder of the £1312 be divided among the other Directors proportionately to their length of service." After considerable discussion, Mr. Brewster's amendment was put to the meeting, and carried. A motion declaring the Company wound up was then passed, and the proceedings closed with a vote of thanks to the Chairman.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The annual general meeting of the Carlisle Gaslight Company was held last Thursday—Dr. Selkirk in the chair. From the annual balance-sheet and report submitted by the directors it was shown that the affairs of the Company were in a satisfactory condition. Several improvements and additions had been effected on the works during the year. The usual dividend was declared, and Dr. Selkirk and Messrs. Pillans, Smith, Watt, Purdie, and Gilchrist were appointed Directors for the ensuing year.

During the past financial year the quantity of gas made at the Inverness Corporation Gas-Works was 24,985,000 cubic feet, and the quantity sold was 18,705,000 cubic feet. Although the increased make only amounted to 511,000 cubic feet, or 2 per cent, there was an increase in the quantity sold of 1,531,000 cubic feet, or over 8 per cent. This difference was caused by the quantity of unaccounted-for gas being reduced. The illuminating power of the year over the year was an average of 26 candles, and the number of extra consumers during the year was 62.

Professor J. S. Brazier, reporting on the illuminating power and purity of the gas supplied to the town of Aberdeen by the Corporation during the past six months, gives the following as the results of his experiments:—

	First Observation.	Second Observation.
Jan. 24 . . .	30.15 candles.	30.15 candles.
March 6 . . .	30.03 " "	30.10 " "
April 30 . . .	30.20 " "	30.45 " "
May 22 . . .	29.95 " "	30.00 " "
June 5 . . .	29.90 " "	30.30 " "
June 29 . . .	29.10 " "	29.30 " "
July 10 . . .	28.85 " "	29.15 " "

The gas had been tested upon several occasions for sulphuretted hydrogen and carbonic acid, but none had been found; also for ammonia, and mere traces only had been found on one or two occasions.

The Gas Examiner for the town of Greenock (Mr. John Chalmers) reports as follows on the quality of the gas supplied during the month of June as determined by observation:—“The gas was examined at the Council office, which is somewhere about two miles from the gas-works: Twenty-five experiments were made, and the illuminating power was—minimum, 25 candles; maximum, 29.40 candles; and average, 26.55 candles.

The Shareholders of the Motherwell Gas Company held their annual meeting on Thursday. In the absence of the Chairman—Mr. J. Russell—Mr. A. Reid presided. A dividend of 6 per cent was declared, and it was resolved to continue the price of gas at 4s. 2d. per 1000 cubic feet. The Chairman and retiring Directors were re-elected, and a Director was appointed in the room of Dr. Thomson, who had resigned.

At a meeting of the Town Council of Glasgow (acting as the Corporation Gas Commissioners), held last Thursday, an important resolution was made by Mr. Walls, the Convener of the Gas Committee, in submitting the annual accounts. He brought out prominently the progress made by the gas supply undertaking by comparing the state of affairs at the present time with that existing in 1870, the first year that the gas supply was under the control of the Corporation. The Corporation had a very large amount in the shape of balance standing to the credit of profit and loss account—namely, £48,000. It would become an important question for the Council to decide how this should be dealt with. While they had made a reduction from the value of the works for depreciation, including all the lands and buildings, of 2d. per 1000 cubic feet, the Corporation was to be made of at least 2½ per cent., from the price at which the works stood in the books. An estimate had been made of the probable results of the working of the various departments during the ensuing year, and, after making a reduction of 2d. per 1000 cubic feet in the price of the gas, it was anticipated that there would be a surplus of about £7000. With reference to the subject of dealing with the £48,000, it had been suggested that out of the gas profits a sum might be set aside for the general purposes of the Corporation. As a rule, he had always objected to that, and whatever might be done at present he hoped would not be so in the future. In connection with the gas supply, the following motion:—“That a further reduction of 2½ per cent. be written off all the works except meters, and charged to profit and loss; also that the sum of £5000 be handed over for the general purposes of the Corporation, on the condition that a similar amount be applied to the improvement of George Square.” The Town Council, after a short discussion, adopted the motion. Mr. Walls was very satisfactory indeed. A great deal of the saving was due to the Works Committee, and especially to the Convener of that Committee, who had given no ordinary amount of attention to the work. The whole of the members of the Gas Committee had taken the greatest interest in the work, and the attention of those gentlemen the satisfactory result recorded was largely due. Mr. Baillie Lamberton remarked that the meter account, which stood at £140,000 two years ago, had been reduced to £131,000, while the efficiency and maintenance of the meters had been attended to, the Committee having expended £2000 more last year in the repair of meters than formerly. The minutes were approved of, including the proposal to reduce the price of gas from 3s. 10d. to 3s. 8d. per 1000 cubic feet.

Business was done last Wednesday in the stock of the Edinburgh and Leith Gas Company at £32 per share.

The annual inspection of the Loch Katrine Water-Works was made by the Glasgow Corporation Water Committee on Friday and Saturday, the 30th and 31st ult. About 40 of the Commissioners, accompanied by the leading officials and a few friends specially invited, went the round of the works, beginning with the Mugdock reservoir and the straining well, and terminating with the works at Loch Venenach on Saturday. Most of the party remained at the Trossachs Hotel over Friday night.

It seems that a large number of the ratepayers of Hawick are dissatisfied with the decision of the Town Council to proceed with the Dodburn water supply works. They have already held one public meeting on the subject, and are about to hold another; but it is not likely that the opposition will have much, if any, influence with the Town Council. The agitators are in favour of what they believe to be a cheaper and better scheme.

Last week's Glasgow pig iron market was very firm. Up to 55s. 6d. cash was paid on Wednesday, but at the close of the week a reaction set in, owing to some heavy realizing, and on Friday afternoon as low as 54s. 4½d. cash was quoted by sellers.

The local trade in coal is very meagre, and a good deal of the shipping demand is being met from the Ayrshire ports, owing to the strike now prevailing in Lanarkshire.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of this district, if actually no worse, is certainly in no better position since the late report, and there is still an absence of any indication of early improvement. The production of round coal throughout the district continues much in excess of requirements, notwithstanding the almost general restriction of the output, and the knowledge that there are not only large stocks in the district; but that there is also a readily available means of largely increasing the present production, naturally encourages buyers of gas coal to hold out as firmly as ever for long forward contracts at extremely low prices. The strong position which gas coal consumers have taken in this respect has, in some cases, induced the principal colliery firms, who were previously holding out against long contracts, to accept such contracts, or so contracts have been seen lately, offered by one of the largest firms in Lancashire, for delivery extending over five years, but in this case a somewhat higher price has been obtained than they were willing to take for a twelvemonth's contract, beyond which they had previously declined to quote. The contracts for the Salford Gas-Works have not yet been settled, the Corporation, I understand, having made arrangements for submitting samples to further tests. So far as prices can be ascertained, they average about 6s. 6d. per ton for best screened Lancashire gas coal at the pit; but there is a good deal of Wigan four-foot coal being sold for gas-making purposes at under 5s. per ton at the pit. Manchester district canal is quoted at about 11s. 6d. per ton at the pit; but good Wigan canal is bought at about 10s. per ton; but there are inferior descriptions of canal offering in this market from outside districts at much lower figures, tenders for Nottinghamshire canal having been made for delivery equal to Manchester at from 9s. to 12s. per ton.

In other descriptions of round coal the market has undergone no material change. House fire coals do not meet with any improved demand, and the better classes especially are had to sell, with a good deal of stock going down. At some of the best coal collieries Arley is still quoted at about 3s. to 3s. 6d. per ton at the pit; but good qualities are to be readily bought at 2s. 6d. per ton, and common sort about 2s. per ton, with Pemberton four-foot coals ranging from 5s. 6d. to 6s. 6d. per ton according to quality. Common round coals still meet with only a very small demand for either steam or manufacturing purposes, and are extremely low in price, sellers being plentiful at from 4s. 6d. to 5s. per ton at the pit. Engine fuel is steady in price, and a slight improvement is shown in the market, fetching from 4s. to 4s. 3d., and good slack 3s. 6d. to 3s. 9d. per ton at the pit.

In the iron trade prices are still very firm, but so far as consumers in this district are concerned, the demand is only limited. Local makers of pig iron are usually in a position to supply the requirements of the district, and their quotations are firm at 50s. per ton, less 2½ for No. 8 foundry, and 49s. for No. 4 forge, delivered into the Manchester district. Finished iron makers are busier, and Lancashire bars delivered into the Manchester district now average about £5 5s. to £5 10s. per ton.

It has long been a matter of complaint amongst Lancashire colliery proprietors that as far as the London market is concerned they are placed at a disadvantage with other districts, by the comparatively high railway rates which are at present charged, and an effort is being made by the South Lancashire and Cheshire Coalowners Association to obtain some concession in this direction from the London and North-Western Railway Company.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The output of coal in the South Staffordshire district has not materially increased of late, and for the purpose of a substantial increase which were held at the commencement of the quarter have not been realized. Notwithstanding the fact that the mills and forges are running full time, there have been but few good and businesslike contracts made. The doubts held by the manufacturers of the country are prevalent, and each one tends to make the demand for coal in transactions other than of a hand-to-hand character. The demand for gas coal is, however, of a satisfactory nature, and some good contracts continue to find their way into this locality. Domestic qualities are not so much sought after, and those receiving the greatest call are of the thick class. Prices are no stronger; iron is about the same for all kinds. Ironstone and other minerals are receiving more attention, and several large sales have been made during the week.

The Mines Drainage Commissioners on Friday last issued a circular to the owners and occupiers of mines in the Tipton district, calling their attention to the fact that the Board had been empowered to make orders, and were being taken to exempt that district from the operation of the Board were successful, and soliciting their voice in opposing the undertaking. This subject is one in which great interest is being taken by both the coal and iron masters hereabouts. The result of the working of the Hamstead Colliery is said to have shown that there is an abundance of thick coal, fully equal in quality to that of the old South Staffordshire kind, and the coal mine have resolved to increase the capital to £260,000.

The iron trade continues to show a slight improvement; during the week some good business transactions have taken place at prices satisfactory to makers. There is, however, a disposition to wait, and the price of iron arises from the belief that prices have been unduly forced up. One house—namely, that of Messrs. Williams and Co.—have issued notices of a reduction of 10s. per ton on their “mitre” brand. They are, however, a single exception, and there are not other firms making such a reduction. A great deal of the pig makers are failing to employ the best quality of four-foot any but the best stock on hand. At Birmingham, on Thursday, one firm booked an order for 1000 tons of pig iron at satisfactory prices, and attempts were made to place a few other extensive lines. The Wolverhampton market was well attended on Wednesday, and a steady trade was done. Though not numerous, orders were placed for several qualities of manufactured iron at remunerative rates, and a good number of inquiries were reported. Marked bars were firm, and with the exception of the firm above mentioned, no reductions were notified. Unmarked qualities changed hands at £6 10s. to £7 10s., though £6 15s. was a price at which an enormous quantity of the best quality of iron was sold for galvanizers sheets, which were held especially low, and only a few sellers were willing to take orders at existing rates. All-mine best-class pigs realized £3 10s.; and in a few instances £3 15s. was reached. The average rate at which part-mine were booked was £3, and cinder pigs were quoted at £2 2s. 6d. Heavy ironfoundry work was occupied, and the operations include a very fair average of work for the foreign market—of which Indian railway requirements are conspicuous. Boiler and tube makers report a slight improvement in business for the present quarter over the past.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The iron trade throughout the greater part of the county does not exhibit any material alteration. In some of the heavy branches devoted to castings there is a pretty good trade, but builders and miscellaneous

NEWCASTLE-UNDER-LYME GAS COMPANY.—The annual meeting of this Company was held on Thursday, the 29th ult. Mr. W. Hargreaves, Chairman of the Directors, presided. The report of the Manager (Mr. W. Winstanley) and a statement of accounts having been read, the usual dividends were declared—viz., 10 per cent. on the original shares, and 7½ and 7 per cent. respectively upon subsequent issues.

work is yielding but little employment. There is but little change to record with respect to the output of pig iron. Most of the furnaces which have been in blast for some time are still at work, but the output exceeds the demand. The tonnage of ironstone raised in the district is very small, and the greater portion of what is used has to be obtained from North Lincolnshire, where supplies are not only ample, but within a few feet of the surface. There still continues to be a fair business done in Bessemer steel mill and tires at the Penistone works and other places in the county.

The steam coal trade is about the only branch where anything like a fair business is being done. Most of the pits raising a good tonnage of steam coal are sending largely to Hull. The collieries in the West Yorkshire district are doing a fair trade, Allerton Main having sent 2391 tons during last month by rail and water. The West Riding and Silkestone pits are accredited with 10,589 tons. Fryston Main and Glass Houghton figure the most conspicuously among the West Riding pits; the former forwarded 3230 tons, and the latter 1448 tons during July. By far the largest tonnage is, however, sent from the collieries in the South Yorkshire district. Donaby Main, which colliery is the nearest to Hull, is sending largely by water, 8460 tons having passed by that route, and 3936 tons by rail. From Eleazar 3044 tons were sent by water, as well as 3688 tons from Manvers Main by the same route. Shiremoor is a large contributor by water; Swathmore Main, Whitwood, Kilmhurst, and Roundwood by rail.

The demand for house coal is very feeble, and but a limited tonnage is being sent over the Midland and Great Northern routes to the Metropolis. There is also a very quiet business doing with the Eastern Counties and other markets to which coal is supplied. At some of the pits the soft coal is being stacked in order that the demand for "hard" may be met. Prices are still low, and no change is likely to be recorded for at least some months are to come.

Manufacturing coal and gas fuel are in fair request, the latter being more largely supplied to the various gas companies than it was a few months ago. Some of the pits working the Silkestone seam have more inquiries for this class of fuel than they have had, owing to the low prices at which supplies can be procured.

A further falling off must be recorded in the coal trade, and this being the case, prices are giving way. As has been several times intimated in the reports, the new pits which have been opened in the county are not nearly all at work. In some instances, where new ones have been dried, they have never been put into further use, owing to the falling off for smelting purposes. The quantity sent to North Lincolnshire is on the wane, although the quality of the coke at present made is much superior to what it was a few years ago.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENCE.)

The coal trade of the North of England is comparatively dull, and the demand for every description of fuel moderate. As regards steam coals, the prospects for farther on in the season are most unsatisfactory, the gas collieries being mainly engaged in working coals which have been contracted for over the year. The best pits are well employed; but the business which is doing in the open market is not large. Seaborne house coals are not much looked after. They are low in price, and are very bad to sell. The demand for coke is dull just now, as nearly all the contracts have been arranged. The quoted prices of coals generally remain about the same; but in many instances larger discounts have to be allowed to enable collieries to make a market.

The coasting freight market continues in a depressed state. Rates are miserably low for London, the east coast and the Channel ports. A limited business is doing in gas coals to Ireland. Steamers continue to take gas coals out to the Baltic; but the business has not commenced. It does not usually do so for the bye-ports until after the harvest. As there is an abundance of small second-class steamers pressing on the market, it is rather improbable that there will be much alteration in the rates over the autumn. The market favours shippers.

In the North of England and Cleveland iron districts the trade has been quiet but steady, and prospects are looked upon as encouraging. Prices have improved a little. Makers are well supplied with orders for some weeks to come, and decline to sell further forward. All descriptions of metals are stronger. Lead has advanced about £1 a ton. Rich Spanish brought £17 per ton on the Tyne; Galena £16 2s. 6d.; and English, £17 per ton. Merchants are disposed to hold.

In the manufacturing iron trade, ironfounders are receiving more inquiries, and finished iron manufacturers have enough to keep them going for a couple of months. The demand for fire-clay goods, especially

second-class sorts, is not quite so strong; at the same time shipments are very well sustained. The chemical trade of the Tyne and adjacent district is dull. The market was quiet last week; but, on account of the stocks being low, prices remained nominally unaltered. There have been considerable arrivals of timber of all descriptions in the north-eastern ports. It is very well selected. There is no excess of any kind over consumption demand, and it is going off very well. Prices do not alter, and the market is void of speculation.

CHARD GAS COMPANY.—The Directors of this Company have just declared a dividend of 5 per cent. and a bonus of 2½ per cent. on the profits of the past year's working.

THE PROPOSED PURCHASE OF THE FOLKESTONE WATER-WORKS.—In reference to this question, to which we recently referred, one of the Kent County papers says: "The purchase of the water-works by the Corporation is discussed with considerable interest, and any very easy negotiation in the matter is not thought to be feasible. The amount of capital of the Company is not far short of £100,000, and as the £10 shares have fetched, only recently, £20, the purchase of the property will probably be based on something like the sum of £300,000."

THE COSTS OF THE OPPOSITION TO THE EXETER GAS BILL.—At a meeting of the Exeter Town Council, on Wednesday last, the Town Clerk read a letter he had received from Mr. G. Norton, the Parliamentary Agent of the Council, in reference to the costs incurred by the Corporation in promoting the Exeter Gas Bill last year to purchase the works of the Exeter Gas Company. Mr. Norton stated in the letter that he should be happy to give up half his charges, which amounted to about £90, on receiving a cheque for the balance. Mr. Wilkinson asked whether the remainder would be a legal charge upon the rates, and the Town Clerk replied that the amount would have no effect whatever upon the legality or illegality of the charges. It was agreed that a letter be written to Mr. Norton, thanking him for his offer, which was stated to have been quite a voluntary one.

DEATH OF MR. BLAKELOCK SMITH, OF SHEFFIELD.—We regret to have to announce the death, on the 1st inst., of Mr. Ralph Blacklock Smith, for many years the Law Clerk of the Sheffield Water-Works Company, to which office he succeeded his father and the onerous duties of which, especially in connection with the investigation of the claims arising out of the failure of the Dale Dyke reservoir in 1864, entailed upon him severe labour. Towards the end of 1875 Mr. Smith was attacked by serious illness, which for a time arrested his labours, and from which it was scarcely expected he would recover; and although he was subsequently able to resume his place as legal adviser of the Company, it was obvious that it was with restricted energies. He was taken ill at his office on the Wednesday before his death, and although everything possible was done for him by his medical attendant, he gradually succumbed. The deceased gentleman was in his 57th year.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 3028.—FOXALL, J., Newport, Monmouth, "Improvements in dry gas-meters." July, 1880.
3090.—FUSCHIEREZZI, M. G., A. M., and S. S., M. St. Petersburg, "Improvements in rotary engines, pumps, blowers, and fluid-meters." July 27, 1880.
3107.—NABROCKI, G. W. von, Berlin, "Improvements connected with the portable train used in the distillation of gas." A communication. (Complete specification.) July 28, 1880.
3112.—WILKINS, F., Southampton Buildings, London, "Improvements in apparatus for producing light and heat by the combustion of hydrocarbon oils or other inflammable liquids and gases." July 29, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

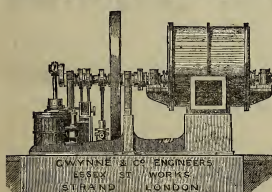
- 492.—LYONS, T. G., Peckham, London, "Improvements in the construction of water-pipes for the purpose of preventing injury to the same by the action of frost." Jan. 30, 1880.
497.—MEWURN, J. C., Fleet Street, London, "Improvements in or applicable to gas lamps and burners." A communication. Feb. 3, 1880.
499.—BOWEN, G., and A. S., Saint Neots, Huntingdon, "Improvements in lighting with compressed gas, and in the apparatus employed therein, especially applicable to railway and other carriages, ships, buoys, and isolated buildings." Feb. 4, 1880.

THE GRAND MEDAL OF MERIT AT THE VIENNA EXHIBITION, TWO MEDALS AT THE PHILADELPHIA EXHIBITION AND TWO MEDALS AT THE PARIS EXHIBITION, HAVE BEEN AWARDED TO GWYNNE & CO. FOR GAS-EXHAUSTERS, ENGINES, AND PUMPS; ALSO 27 OTHER MEDALS AWARDED AT ALL THE GREAT INTERNATIONAL EXHIBITIONS.

GWYNNE & CO.'S PATENT GAS-EXHAUSTERS & ENGINES.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



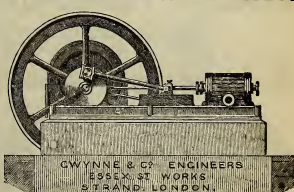
EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

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Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.



52,500 EXHAUSTER, with Horizontal Engine combined.

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TO CORRESPONDENTS.

E. F.—Received. Will write you in the course of this week after reading over the paper you have kindly sent.

W. L.—We think sufficient has for the present been said on both sides.

A. H.—The special gas section of the "National Exhibition of Belgium" is not yet opened. It is not, we understand, even formed.

J. G.—We will endeavour to obtain the information you ask for.

H. G.—Thanks for the interesting information you send. Will make use of some of it next week.

A. SHAREHOLDER, TOTTENHAM.—Your letter is not suitable for publication, even if it had been signed. Our remarks were based upon the evidence which had been given; not, naturally, upon that which you say might have been produced, but was not. If the desire of the prosecutors was, "constrained by a sense of duty," simply to put the facts before their fellow-shareholders, we can only repeat our surprise that a meeting was not called by them for the purpose; and further that when such a meeting was held, the "shareholders of the prosecution voluntarily absented themselves." It is, of course, open to you to take, at the half-yearly meeting, what steps you may choose; we cannot allow the matter to be re-opened in the JOURNAL.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated, by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 17, 1880.

Circular to Gas Companies.

THE half-yearly general meeting of The Gaslight and Coke Company, held last Friday, was marked with great harmony, as might have been expected of an assemblage of Proprietors who were about to receive a dividend after the rate of eleven per cent. per annum.

The Governor, in moving the adoption of the Directors report and the accompanying statement of accounts, took an early opportunity of mentioning the recent explosion near Tottenham Court Road, and while claiming the indulgence of the Proprietors in keeping back information as to the precise nature and extent of the loss which the Company may have to bear, he stated that general opinion in the public press and elsewhere had much exaggerated the extent of the damage that had been caused. He also said that whatever the Company might eventually have to pay would come out of the insurance-fund. Referring to the working results of the past half year, the Governor drew attention to the enormous quantity of coal—605,383 tons—which had been carbonized at the various works of the Company in that period, being the largest consumption ever recorded. The coke account is not yet quite satisfactory, but there are well-founded hopes

that matters will improve in this respect in the ensuing half year. The great establishment which the Directors have organized at Beckton for working up their own residuals is fully answering their expectations. The products of the Company's tar and liquor, as manufactured by themselves, are said to be the best in the market, and the business is proving very profitable. In June, 1879, the tar realized a profit of 1'55d.; and in June, 1880, it produced 3'75d. per gallon, showing an increased profit of nearly 2½d. per gallon in the year. The profits derived from manufacturing sulphate of ammonia are also such as to induce the Directors to retain the liquor themselves as the different contracts for its sale terminate.

To the Deputy-Governor fell the mournful task of mentioning the death of Mr. F. J. Evans, and of paying tribute to his memory on behalf of the Directors, which he did in most feeling and graceful terms. Alluding to Mr. Evans's intention, cut short by his death, of presenting to the Shareholders a painting of the Beckton works, a commission for which he had entrusted to Mr. W. L. Wylie, Mr. Vaughan Richards read a letter from Mr. John Aird, whose intimate connection with Beckton is well known, in which the writer announced that, the commission having been transferred to him, he wished to carry out the original intention of his late friend. Several Shareholders were anxious to record their sympathy with the bereaved family of their late Director, and a special resolution was subsequently passed to that effect. A desire for a portrait of Mr. Evans, to be placed in the board-room, being also expressed, the Directors were obliged to explain that they had no power to carry out anything of the nature of a memorial as proposed. It may, however, be suggested that the Shareholders themselves can very well do what the Directors in their official capacity cannot.

The Proprietors having agreed to leave the settlement of the damages ensuing from the recent explosion entirely in the hands of the Directors, and the Governor having been, by common consent, spared the necessity of saying anything about the electric light, the proceedings closed with the usual votes of thanks.

Following the report by Sir J. Bazalgette and Mr. Kentes to the Metropolitan Board of Works on the recent explosion near Tottenham Court Road, on which we commented last week, we are able to publish in our present issue that by Mr. A. G. Vernon Harcourt to the Board of Trade on the same subject. This report is throughout of a most instructive character. It furnishes just that full and exhaustive examination of the circumstances of the case which we have desired, and which we have maintained that the public had a right to expect. Mr. Harcourt has supplemented the crude information which was submitted to the Coroner's jury by subsequent inquiries of the officers of the Chartered Company, and by his own investigation, and the result is a clear and logical narrative, free from any trace of that air of mystery which at one time seemed to be cast over it.

The conclusions at which Mr. Harcourt has arrived are generally in close agreement with those we have maintained in the "Circular." He finds that the gas which caused the damage entered the main through the valve in Howland Street; that it would have been well had the connection to the working main been left till the last; that the section of main in which the explosion took place was shown by the proving to have been less sound than the adjoining section; that the use of a light for the purpose of testing the contents of the main was an "act of extraordinary ignorance or 'thoughtlessness,'" and lastly, that the explosion was one and not many—the main being charged with a nearly "homogeneous mixture of gases." This latter position he supports by arguments nearly identical with those put forward in the "Circular" last week, and to the minds of most readers he has, we think, made this disputed point as clear as the rest of the circumstances involved.

The reservation with which Mr. Harcourt couples his agreement with the verdict of the jury is an important one which will attract the notice of practical men. Have we a right to expect that a 36-inch valve, made and tested with proper care, shall be found absolutely gas-tight when fixed in position? On this point, as the report says, "no evidence was given," but that could hardly have been for want of data. If an affirmative answer could be confidently given to the question, then it would be unreasonable to criticize adversely the conduct of those who apparently trusted implicitly to the soundness of this one, and were deceived. Even then, however, we could hardly agree with Mr. Harcourt "that the responsibility for the explosion and the destruction caused by it rests almost exclusively upon the ignorance or thoughtlessness of the contractors foreman." That he was singularly

thoughtless in applying the light, we have already said; but it must be remembered that he was dealing with circumstances entirely strange to him, because probably without a precedent in main-laying. Although his unnecessary act immediately caused the accident, yet had he, without using a light as he did, simply removed the cap and proceeded to make the connection, with a fire close at hand and no thought of special precaution being necessary, the disaster would, in all probability, still have happened. For the creation of the conditions, without which the explosion would have been impossible, the man in question was in no way responsible. It seems to us, therefore, hardly just to put upon him more than a share, and not a large share, of such blame as may attach to the occurrence.

The clause of the report which deals with the probabilities as to an explosive mixture being found in the main is hardly, to our mind, very clear. Mr. Harcourt says: "Experience must have furnished some knowledge of the degree of 'soundness' to be expected from large valves; the risk of 'encountering an explosive mixture can thus to some extent 'be estimated beforehand.'" Certainly no experience of ordinary unsoundness guided the conduct of those who fixed this particular valve, and our opinion is that in this and in all cases where stop-valves are fixed the assumption has been that they were absolutely gas-tight—an assumption not based upon sufficient experimental data. The report well puts this aspect of the case when it says, speaking, we assume, of the view of those who did the work: "It was only improbable 'that the main would contain an explosive mixture in what—'over degree; it was improbable that the average rate of 'leakage from the valve should have reached one cubic foot 'per hour, and not have exceeded three and a half cubic 'feet.'" Give up the idea of perfect soundness, and there remains only the chapter of accidents to prevent the formation of the dangerous conditions. The Board of Trade did good service to the gas science as well as to the public when they appointed Mr. Harcourt to investigate and report upon this unprecedented and alarming accident.

The accounts of the Burnley Corporation for the nine months ending March 31 last have just been issued, and show that the undertaking has been well managed. The gas sold was equal to 9160 cubic feet per ton of coal carbonized, with a loss in unaccounted-for gas of 7.714 per cent. The consumption of coke as fuel was 29 per cent. of the production, which is rather high, but is probably affected by the proportion of cannel used, the illuminating power of the gas being 18½ candles. We notice that the price of gas within the borough is 2s. 9d. per 1000 feet, less discount, whereas 4s. is charged outside the borough. This is a great and, to us, injudicious distinction, for, although the quantity sold at the latter rate is very small compared with the consumption at the lower figure, very exceptional circumstances are needed to justify such a marked difference. A profit of £7606 16s. 8d. was made during the nine months.

For an example of wrong-headed arguments leading to a wrong decision on the part of a body of gentlemen who probably mean well, if they only knew how to do it, commend us to the Middlesbrough Town Council, at their last quarterly meeting. The Gas Committee having recommended a reduction in the price of gas, the Council were called on to refuse confirmation to the minute containing the recommendation, by a Councillor whose remarks read like a burlesque of an appeal on behalf of the gas consumers; and from another portion of the same gentleman's remarks we might be led to infer that the gas consumers, relief to whom was denounced as an act of injustice to the ratepayers, must certainly be living altogether without the boundaries of the borough. The burden of this gentleman's song, as of those who followed him on the same side, was, "Bleed the gas consumers, so 'long as they do not complain too loudly; we must keep 'down the rates.'" In the course of discussion, the ratepayers, as usual, were held up to admiration as having conferred a great boon on the gas consumers, which was not altogether admitted by the friends of that long-suffering section of the community, who contended that as the purchase-money of the gas undertaking was being paid off by them alone, and they also paid rates twice over—once for themselves and again for other people—the advantage was not quite on one side. The circumstances of a few large consumers, and the benefits they would respectively derive from reduction of rates or reduction of the price of gas, were also imported into the discussion, not quite fairly, as we hold that special cases cannot be held to authorize departure from the plain principles of equity, which certainly

forbid the taxation of one man for the benefit of another, where all should bear their own burdens. The argument which appeared to have most weight with the majority of the Middlesbrough Town Council was, that a large ratepayer might contribute more to the revenue of the town by way of an overcharge on his gas bill than by the rate which would be levied if the price of gas was lowered. It never occurred to the worthy Councillors who voted in the majority against the reduction in price, that if this meant anything it would also prove that by the simple expedient of manufacturing his own gas the large ratepayer might reduce his contributions to the borough funds to a minimum. Yet this is a consideration which should not be overlooked by those who are responsible for the proper distribution of local rating. Large gas consumers are seldom the noisiest in complaining of unjust charges by which they nevertheless feel aggrieved, and when they are driven to take measures for their own deliverance, it is generally too late for repentance on the part of their oppressors to be of any avail.

The Corporation of Liverpool are in no great hurry to make full use of the power they have acquired to use the electric light, and their delay has not passed unnoticed by the local press. It appears that the Picton Reading Room is the only public edifice yet lighted up in this way, and there are no signs of any further application of the new luminant to any of the bustling open spaces or markets of the city. We do not pretend to be sufficiently deep in the counsels of the Corporation to know why this is so, but we may perhaps form a guess which, in default of better information, may not be altogether wide of the mark. The application to Parliament was so recently made, that the idea of the City Authorities having cooled in their ardour for more light cannot be entertained, without implication of a degree of fickleness on their part which would be monstrous. Perhaps the City Council having had time to reflect on the precise value of the powers they acquired at such cost, have begun to see that the restriction under which they must supply the light—simply at prime cost without a penny profit—is such as to make them hesitate to incur an extended responsibility without the ability to derive pecuniary benefit from it. Unlike the business of supplying gas, which Corporations did not seek to enter into until the absolute safety of the capital involved had been proved by long experience, the establishment of any system of lighting by electricity for general purposes still deserves to be classed as an experiment, in the sense that of several rival methods of producing and utilizing the light there is not one but possesses some damaging qualification which the advocates of the others are always ready to point out; so that the position of a Gas Committee badgered by local partisans of electricity, although troublesome enough at times, is serenely itself compared to that of an Electric Lighting Committee committed, say, to the Jablockhoff system, with an active opposition favouring the Jamin light. We do not know if the demand for more electricity is supported by the public; but, in any case, whether the Liverpool Authorities act up to their powers or not, we may safely predict that they will have a lively time of it, in the council chamber and among the ratepayers outside.

The members of the Southern District Association of Gas Engineers and Managers met at the Guildhall Tavern, London, on Thursday last—under the presidency of Mr. James Hunter, of Woolwich—when a paper on "Hislop's Process 'of Revivifying Spent Lime'" was read by Mr. A. F. Wilson. The principal facts brought forward by Mr. Wilson have been already published, the most exhaustive account of the process ever yet made public being the report of the Committee of Inspection appointed by the West of Scotland Association of Gas Managers, which was printed in our issue of the 29th of June last. Still, Mr. Wilson did good service in bringing the matter forward in such a clear and concise manner as to give it fresh interest, and, if possible, to impress its importance more forcibly than ever on the minds of those of his brethren who are anxious to keep abreast of the latest improvements in gas manufacture. Mr. Hislop's process is no longer an experiment; it has passed from the stage of probation into that of ordinary commercial practice, its vital statistics being now readily ascertainable by any one who thinks it worth his while to inquire into them. Briefly and plainly stated, ordinary lime can now be used over and over again for gas purification as reliably as oxide of iron, at a cost for preparation of between 6s. and 7s. per ton, including everything, and the margin thus indicated appears to be enough to cover the various fluctuations in the cost of fuel, labour, and construction in different localities. This being the

case—and the truth of the statement can, as we have said, be verified by any one who will take the trouble to do so—the extended application of the process appears to be only a question of time. Local circumstances, chiefly with reference to the first cost of quick lime, will naturally be most potent in determining the value of the process in every instance. A secondary but still highly important consideration in its favour is the immunity which it seems to offer from nuisance to neighbourhoods of gas-works where lime purification is practised. Costly expedients have in some cases to be adopted for the mitigation of the nuisance caused by the offensive emanations from foul lime, both in the works and in the course of its removal for manure. If it is possible, as Mr. Hislop shows, to avoid all nuisance of this kind, and at the same time to create a valuable article out of what is otherwise comparatively worthless, and a source of constant trouble, he has deserved well not only of the producers of gas, but of the rest of the community. Mr. Wilson's paper, with the report of the discussion that followed the reading of it, we are compelled to hold over till next week.

Mr. T. Whimster's paper on "Spence's Metal for Jointing 'Main-Pipes'" which was read before the late meeting of the North British Association of Gas Managers, and will be found printed in another part of to-day's JOURNAL, was an effort, by a gentleman who does not like lead joints and is not satisfied with turned and bored pipes, to prove that the new material in question is capable of giving better results than either. This is so far an open question that, while welcoming any additions to the information we already possess respecting the behaviour of joints made on this system, we cannot say that the balance of evidence is for or against it, nor will it be safe to predict its ultimate failure or success until more is known about it, not only as a matter of experiment, but from general experience under the various conditions wherein the lead joint has proved on the whole such a faithful servant. It cannot be denied that the patent "metal" is seriously mistrusted by many whose adherence to the old methods of main-laying is not to be qualified as entirely the result of prejudice, and when it is remembered that, in order to cause a general abandonment of one thing for another, the newer needs not only to be as good as that which it seeks to supplant, but must also be a marked improvement on it, it must be confessed that the prospect of Spence's metal speedily taking the place of lead for jointing gas-mains is not very bright at present.

Mr. J. McGilchrist's communication on "Retort Settings," read at the same meeting, contains nothing that is novel, but has many observations marked by practical good sense. It appears, however, that very small settings are still in favour in Scotland, if we may judge from Mr. McGilchrist's list of works, nothing larger than five being mentioned, except in the case of Glasgow. Mr. McGilchrist only sets four 20-inch retorts in an arch 6 ft. 6 in. wide. There is no difficulty in setting six similar retorts in an arch of that width without unduly distressing the stokers; and the saving of floor space thus effected is worth consideration, to say nothing of the diminution in the number of furnaces also obtained.

If recent reports are to be credited, Strong's process of making water gas for heating purposes is the greatest advance that has yet been made in the utilization of carbon as fuel. Briefly stated, this process consists in burning coke or other suitable form of solid fuel in a special kind of furnace, and the hot products of its combustion are made to evolve and superheat a certain proportionate quantity of steam, which having been caused to pass en route through a shower of peat in the form of powder, is returned through the original carbon fire, the gas resulting from this circular operation possessing, according to a statement quoted in a recent number of the *Engineering and Mining Journal*, and reprinted in another column, a practical heating effect equalling, less only ten per cent., the ultimate theoretic value of the fuel from which the gas is made. The most extraordinary feature of the facts, as recorded, is that the heating power of the gas produced from the peat powder, taken separately from the portion yielded by the coke, actually exceeds the value originally belonging to the solid material itself! This is explained by referring to the manner in which the peat gas is produced, which is, as stated above, by the heated steam, or, in other words, by an outside agency. Now when an experimentalist is engaged in finding the heating power of a solid fuel, such as peat, he takes account of its radiant heat together with the heat of the products of its combustion. But he has no means of measuring the amount of heat which is absorbed in the evolution of these com-

bustion products, and is therefore retained within the burning body itself. That proportion of the original energy of the fuel which it requires in order to keep itself burning eludes his methods of observation. But when a combustible is reduced to a powder so fine as to undergo what is practically an explosive disintegration into its elements, in presence of an exterior heating agency, such as a current of steam, it is very evident that the loss of ordinary combustion is avoided; and hence it is not a reversal of the accepted principles of conversion of energy, however surprising in itself, to find that in this particular instance of peat and its gas, the latter can be burnt with greater practical effect than the former has been hitherto thought to possess. From this striking example we may draw the general inference that the commonly received values of the heating power of solid fuels, such as coal, coke, and wood, may be, and probably are, considerably below the truth. By this discovery the way is opened for a much more reliable series of experiments for the determination of these values than any already recorded. We have here another illustration of the way in which one path of progress in physical science branches out into another, itself to give rise to unexpected ramifications. Into the merits and possible developments of Strong's process we will not now enter, as very much more will, in all probability, be heard of it in the near future. We have, however, learnt to appreciate the benefits obtainable from the use of fuel in a gaseous form, by the example of the Siemens process, wherein solid carbon is reduced to carbonic oxide in an atmosphere of steam, or rather of air heavily charged with watery vapour. It will afford a fair idea of the superiority claimed for Strong's system if we quote from a comparative table the statement that the proportion, on a monetary basis, of the theoretic value of the Siemens fuel, as compared with the practical value of Strong's gas, is as 30 to 89. These figures must, of course, be taken for what they are worth. They are likely to be warmly challenged, and the public will wait with cold impartiality to see the final triumph of the best principle; although it must not be forgotten, if the newest system should attain universal favour and extensive adoption, that the way for scientific methods of using fuel has been made easy by the hard-won battles against ignorance and prejudice of such pioneers as Dr. Siemens, who, even if surpassed, will still hold a position not easily shaken.

Water and Sanitary Notes.

At the time of our going to press last evening, Earl Fortescue had the following question to put to Her Majesty's Government:—

Whether, considering the injury caused to the public health in the Metropolis by the stagnant detention of water in tanks and cisterns on the intermittent system of distribution, considering the excessive loss of life and property there caused by the same system, and considering the high and increasing rates paid for such Water Supply, the Government have offered any other terms for the purchase of the Water Companies works now that the terms lately proposed have been rejected; and whether, in the event of the non-acceptance of such other terms, if offered, the Government are prepared to take compulsory measures to arrest the continuance of the evils declared by several successive Parliamentary Committees and Royal Commissions to arise from the existing conditions of the Metropolitan Water Supply.

The report of Sir W. Harcourt's Select Committee furnishes a ready answer to all such questions as this. According to that report, the whole subject is to be referred to a Water Authority. If the Government will only promise to bring in a Bill next session for the creation of this Authority, Her Majesty's Ministers may then plead that they are doing all that can be properly required of them. This may or may not be the kind of answer that Earl Fortescue will receive; but the probability is that the Government will undertake to do as little as possible. The scheme of Sir Richard Cross has been sacrificed, and that is enough for the present.

A "paper handed in" to the Select Committee on London Water Supply by one of its members—the Right Hon. Joseph Chamberlain—consisted of "A Statement of the Conditions of the Birmingham Water Purchase, submitted by Alderman Avery, the Negotiator on the part of the Corporation of Birmingham." This statement begins by saying that "the evidence of Mr. E. J. Smith before the Select Committee is so extraordinary, with respect to the Birmingham purchase, that it appears necessary correct particulars should be stated." As Mr. Smith is "beyond defending himself," a reply to this document has been indited by "A Water Shareholder," and sent to *The Times*. The writer of this letter proceeds to show that "the main point which Mr. Smith proved, this paper corroborates." "But," he adds, "the Committee appear to consider that what is a reasonable and fair principle for Birmingham is inadmis-

"sible for London." Hence the Committee "take a new departure, and suggest, if the London Companies will not sell at such a price as the purchasers think right—not that arbitration shall be resorted to, but that a competing supply shall be introduced, necessarily with the public funds." It certainly follows that if a policy like this is to prevail, "faith in Acts of Parliament" will receive a rude shock.

The amalgamation of all the London Water Companies, on the basis of the terms embodied in the late Purchase Bill, is suggested by "A Water Shareholder" who writes to *The Times*. It is proposed that the Companies should thus "mix hard and soft" for the good of the public, and take the benefit of the economy to themselves. If "unification" will save money, the Companies may as well agree to adopt such a policy on their own account. But we fear the day has passed by in which a Bill for the amalgamation of the London Water Companies could be carried through Parliament. The question has now passed into another phase, and though amalgamation need not prevent purchase, but would rather facilitate it, a Bill for the amalgamation of the Companies would in all probability be overshadowed by the scheme for a Water Authority. Still the proposal is worth considering, and might command attention as an alternative. A few years back amalgamation, as we have frequently pointed out in these columns, would have been a very hopeful project, and if accomplished would have taken more than one arrow out of the enemy's quiver.

The *Pall Mall Gazette* indulged last week in a long article entitled "The End of the Water Inquiry." Our contemporary has a notion that London could be properly supplied with water on a new system for a sum of £12,000,000. It is singular that this amount is just about the cost of the old works, concerning which Sir William Harcourt's Committee say that "a considerable portion of the cost may be attributed to works which have become useless, or have been reduplicated." Had London, at the time when the Water Companies commenced, been what it is now, no doubt the existing works would have cost less. But it should also be remembered that the Companies have incurred a large outlay in view of demands which are yet in the future. It is singular that a scheme which is to start with all the advantage of experience, and with an advanced condition of things, should be estimated to cost as much as the works which have been compelled to proceed piecemeal. If the estimate be thus high, what may we predicate of the final reckoning? It does not appear that the new lights are so very much better than the old, even if we take the former at their own valuation.

The *Birmingham Daily Gazette* deals with the London Water Question after a manner somewhat different from that which characterizes many of our contemporaries. Acknowledging that the end arrived at by the Select Committee is good—namely, placing the Water Supply of the Metropolis under the control of some public body—the *Birmingham Gazette* goes on to say, "but the means suggested for the attainment of that end, as well, indeed, as the whole tenor of the report, are not such as should be looked for in a document emanating from a body of gentlemen entrusted with the duty of fairly considering the interests of all parties." The Select Committee is said to have "prejudged" the question upon which it was appointed to adjudicate; "it has made itself an advocate where it ought to have comported itself as an arbitrator." Our contemporary observes that as the case of the Companies was not gone into before the Committee, the latter were not justified in adopting "the buyers view of the question," and preparing a report "which is for the most part one continuous threat against the Companies," with a complete "disregard of lawful rights."

We learn, on the authority of a weekly paper connected with the iron and steel industries, in reference to the Metropolitan Water Question, that "ample and indisputably pure supplies are accessible at a cost of little more than a half or two-thirds of the sum the existing Companies would willingly accept as the purchase-money of their works." We should like to know more precisely where supplies to the extent of 150 million gallons a day are thus to be obtained. In the next place, we would ask whether it is absolutely necessary to expend £15,000,000 or £20,000,000 in addition to the outlay already incurred for the Metropolitan Water Supply. Statements such as that to which we allude are implicitly accepted by many people, and go to form what is designated "public opinion." But the Water Supply of the Metropolis must needs be a matter of fact, and hence we expect to see a good many opinions upon this subject ultimately falsified.

The Registrar-General's return for the first week of August shows a number of deaths from diarrhoea in London above

the average. This cannot very well be attributed to the temperature of the Thames, for it is recorded that "the temperature was again below the average, and the rainfall showed an excess." The 367 fatal cases of diarrhoea included 271 of infants under one year of age. It can hardly be supposed that these had imbibed much of the Metropolitan Water Supply, and their malady cannot be reasonably attributed to the water of the Thames and the Lea. In respect to quantity, the average daily volume supplied by the London Water Companies in July reached the astonishing figure of 150,398,000 gallons. In July, 1879, the average daily supply was 135,618,000 gallons. The increase in the number of houses supplied last month as compared with the year before was 22,617, or at the average rate of one house every twenty-four minutes—a significant piece of evidence as to the growth of London.

The opponents of the Vyrnwy water scheme in the Liverpool Corporation appear to have reconciled themselves to that project, now that it has been successfully carried through Parliament. At a recent meeting of the City Council a satisfactory degree of unanimity was displayed, and there is every prospect that the Corporation will put forth its united energies to carry out the project. There is no time to be lost, for it is estimated that it will take five years to bring any part of the Vyrnwy waters into the Liverpool supply. After the wet seasons we have lately experienced, we may look forward to a cycle of dry, hot summers, which will severely tax the water resources of towns. The ultimate expenditure under the Liverpool scheme is reckoned to exceed three millions of money. The result achieved will be a minimum supply of forty millions of gallons daily, enabling the Corporation to sell water to adjacent districts at a moderate price. When the supply sinks to thirty gallons daily per head of the Liverpool population, the Corporation can give five years notice to discontinue the supply to the districts that are outside their jurisdiction. The answer given by Earl Powis to the Liverpool authorities at an early stage of their enterprise, is one deserving of consideration by all landed proprietors who have the opportunity of either aiding or hindering projects for the water supply of towns. His lordship's reply ran thus:—"The most pressing want of our great communities is an ample supply of pure water, and so far from throwing difficulties in the way of Liverpool, I will do all I can to assist them in obtaining it." The promise thus made, the Earl has fulfilled. Reference was made to this incident at the meeting of the Liverpool Corporation yesterday week, on which occasion an enthusiastic vote of thanks was presented to Mr. Wilson, the Chairman of the Water Committee, and Mr. Bower, the Chairman of the Parliamentary Sub-Water Committee, for their able services and indefatigable exertions in promoting the passing of the Bill. The undertaking, at the outset, was beset with many difficulties, and formidable opposition was threatened. The obstacles have been happily overcome, but great exertion and sound judgment must have been necessary to bring matters to so successful an issue.

A supply of water from the lower greensand has been made available for the inhabitants of Godalming and its vicinity. The works, constructed from plans prepared by Mr. Jabez Church, C.E., of Westminster, were opened a few days ago in the presence of a distinguished party, the steam-engine for raising the water being set in motion by the Hon. Miss Brodrick, daughter of Viscount Milderston. The noble Viscount presided at the luncheon which followed, and gave an interesting address, in the course of which he stated that £10,000 would defray all that was necessary to put the undertaking into fair working order. The supply is said to be of excellent quality, and practically inexhaustible. The works are situated at Frith Hill, and the Company have power to raise capital to the extent of £15,000.

CLEVELAND WATER COMPANY.—The twenty-fourth half-yearly general meeting of this Company was held at Saltburn on Wednesday last—Mr. J. T. Wharton in the chair. The report of the Directors which was presented stated that after providing for interest, rent, and other preferential charges, there remained a balance of £2496, out of which dividend at the rate of 50 lbs. on the original and "A" shares, and of 41 lbs. on the "B" shares, were recommended, free of income-tax. This would absorb £2001 6s., and leave a balance of £495 15s. 10d. to be carried to the credit of the next half year's account. The accounts showed that since the commencement of the Company the total capital expenditure had been £77,483 15s. 7d., the whole of which was represented by receipts from ordinary shares. On revenue account, £3296 15s. 6d. had been received from Jan. 1 to June 30, inclusive of a small balance brought from the previous half year. The working expenses and interest on prepaid calls absorbed £800 7s. 8d. The Chairman, in moving the adoption of the report, gave some interesting statistics of the working of the Company during the past half year compared with the corresponding six months, and in nearly every department announced an increase in the receipts, whilst the outgoings were, as nearly as possible, the same as before. The dividends recommended in the report were declared, and the proceedings concluded with a vote of thanks to the Directors and Secretary.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

MECHANICAL SCRUBBERS.

SIR,—At the meeting of the North British Association of Gas Managers reported in your last issue, I perceive that several gentlemen referred to what would happen if the supply of water to a mechanical scrubber were stopped, or should the motive power cease. I beg to say that one of Anderson's Brush Scrubbers was erected on these works two years ago, and wishing to see how strong the liquor could be obtained at the bottom before foul gas appeared at the outlet, I made the following experiment:—

The scrubber is 4 feet by 3 feet on plan, having five brush drums. Our usual working is to make 12 to 14 oz. liquor, and when 7000 feet of gas was passing per hour the gas was pure about the third brush. I then stopped the supply of water, and at the end of 41 hours the liquor below had increased to 19½ oz. That in the first brush was 17½ oz.; in the second brush, 13½ oz.; third brush, 6 oz.; fourth brush, 2½ oz. The gas was still pure, and the fifth or last brush was not tested, as I had to discontinue the experiment, having other things to do.

We drive our scrubber by a belt of the engine that drives the exhaustor. Consequently, as the speed of the exhaustor is, so is the speed of the brushes accountably with the make of gas. If the engine were to stop, so would the exhaustor, which would be much worse than the stopping of the scrubber, for in a few minutes I could rig up a lever and turn the latter by hand.

I may mention that last year I made a ton of sulphate for every 112 tons of Newcastle coal used. Before I had the scrubber, although I had a washer that gave 16 to 20 inches of pressure, it took about 140 tons of coal to produce a ton of sulphate. The gas is always pure from ammonia, as indicated by gas bubbling through a solution of reddened litmus, or by the turmeric paper test.

Gas-Works, Waterford, Aug. 12, 1880. G. DANSEIN, Manager.

CORRECTIONS FOR TEMPERATURE AND PRESSURE.

SIR,—Your issue of the 3rd inst., containing Mr. D. C. Niven's letter, came into my hands this morning; and, with every desire to be obliging, it is with regret that I find myself unable to make any alterations in the formula he is so anxious to have decorated with unnecessary symbols. As might have been seen by my letter, they were not my property. For my desire in writing was to show the formula used in the construction of the new table of the Metropolitan Gas Referees.

The formula $V \sqrt{\frac{P}{T}}$ which he considers to be an instance of my "carelessness," is one used by Professor Clerk Maxwell in his celebrated treatise on "Heat," and as the subject is getting a weary one, I will leave it to your readers whether they would prefer to follow Clerk Maxwell, the Metropolitan Gas Referees, the late Mr. A. Wright, and a host of scientific writers, on the one hand, or Mr. D. C. Niven on the other. For my own part, I would rather be "careless" with the former than "careful" with the latter.

Lovecroft, Aug. 10, 1880.

LEWIS T. WRIGHT.

[This correspondence must now cease.—Ed. J. G. L.]

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday at the Chief Office, Horseferry Road—the Hon. RICHARD HOWE BROWNE, the Governor, presiding.

The SECRETARY (Mr. John Orwell Phillips) read the notice convening the meeting; and, the corporate seal of the Company having been affixed to the register of Proprietors, he read the minutes of the last half-yearly meeting, which were approved as correct by the present meeting, and signed by the Governor.

The following report and accounts were taken as read:—

The Directors have, with deep regret, to announce the less which they have sustained through the decease of their esteemed friend and colleague, Mr. F. J. Evans, who, first as an Officer, and later as a Director of this Company, had faithfully and devotedly served its interests during a period of 43 years. For upwards of a quarter of a century Mr. Evans had occupied a foremost position as a gas engineer; but, as the designer of the Company's lately-erected works at Beckton, he added to his already large reputation, and achieved a celebrity no less than well deserved.

On the 6th ult., a very serious explosion occurred in a new trunk main which was in

LIEGEL'S REGENERATOR FURNACES.

We have received a communication from Herr Liegel, of Stralsund, in reply to Herr Klönne's letter—published in the JOURNAL for July 13, p. 51—questioning the originality and value of his (Liegel's) gas generator furnaces. We cannot find space for Herr Liegel's letter, in which he states that his first experiments in this direction were carried out in 1864, before any other gas generator, besides Siemens's, had been heard of. He avers that his perfected designs have nothing in common with the Böttner oven, which gave him his first impulse in the matter of gas firing, and that he first heard Herr Klönne's name only three years ago. He first became acquainted with Herr Klönne's ovens last year, through the publications of the German Patent Office, whereas his own ovens were first built at Frankfurt in 1874. Both Herren Liegel and Klönne have patented their furnaces, about which there appears to be a dispute as to the novelty of certain claims made on either side, and respecting which we must leave judgment to the proper authorities. According to Herr Liegel's statements, the misunderstanding between the parties is due to two individuals having independently arrived at similar conclusions, which is by no means rare, but is not the less unfortunate for both.—Ed. J. G. L.

Miscellaneous News.

OPENING OF THE FRITH HILL, GODALMING, AND FARNCOMBE WATER-WORKS.

Tuesday, the 3rd inst., witnessed the formal opening of the new works—constructed from the plans and under the guidance of Mr. Jabez Church, C.E., of Westminster—of the Frith Hill, Godalming, and Farncombe Water-Works Company. Power to construct the works was obtained, from the Board of Trade, by a Provisional Order granted in 1878, the capital authorized to be expended in the undertaking being £15,000.

Before anything was done at the works, trial bore-holes were sunk, when it was proved that an inexhaustible supply of water of excellent quality was to be obtained from the lower greensand. Operations were then begun on the 22nd of July, 1878, and the works have been going on steadily ever since, though great difficulties arising from the nature of the soil have been encountered. The works are situated at Frith Hill, in the midst of the lovely scenery surrounding Chartreuse, the engine and boiler house being at the foot of the hill and the reservoir at the top. The engine is a horizontal one, of 15-horse power, and there are three throw pumps—only two of which are used, the other being in reserve—throwing 10,000 gallons of water per hour. The well is 63 feet deep, and every precaution has been taken to prevent contaminating material percolating into it. It contains 40 feet of water whilst pumping is going on. The reservoir, which is situated on the top of Frith Hill, is capable of holding 360,000 gallons, and is covered in and ventilated with shafts. Its size is 80 feet by 60 feet, and 12 feet deep. Close by stands a water tower, built of Bargarie stone and brick, which holds a tank 15 feet in diameter and 19 feet deep, of wrought iron, and with a capacity of 28,000 gallons. The tower is castellated in shape, and well adapted for the purpose for which it is intended. The rising main is 6 inches in diameter. The Company have engaged as Manager Mr. Ede, from Cambridge, and formerly at the Guildford Water-Works, and a house for his accommodation will be built later on.

The inaugural ceremony was performed at the engine-house, by the Hon. Miss Brodick, daughter of Viscount Middleton, the engine being set in motion and the water subsequently turned on at a fountain in the adjoining enclosure.

Luncheon was subsequently served to the party invited to be present at the opening of the works.

course of being laid in the neighbourhood of the Tottenham Court Road, with the object of rendering more perfect the general distribution of gas in the Company's district. The circumstances which led to the accident are of an altogether exceptional character, and are in no way dependent upon, or connected with the ordinary duty and means of supply. They are respecting the earnest attention of the Directors, who, while declining to admit a legal liability to make good the damage caused, did not hesitate, in the interests of the public, to undertake the imperatively necessary repairs with the utmost promptitude. They are happy to add that the consequences of the accident have proved to be less grave than they at first apprehended.

The attention of the Proprietors was drawn, in the last report, to the introduction, by the Corporation of London, of a Bill affecting the Company and the Directors have now to state that, through the interposition of the Board of Trade, and with the concurrence of the Metropolitan Board of Works, amendments have been arranged, which have rendered the Bill less objectionable than as it originally stood.

The working of the half year needs no comment. The accounts to the 30th of June, which are annexed, are of a satisfactory nature, and show that the net profits, after providing for all preferential charges and maximum dividends on the "B" and "H" stocks, enable the Directors to recommend a dividend on the ordinary stock of the Company at the rate of 11 per cent. per annum.

No. 1.—STATEMENT OF STOCK AND SHARE CAPITAL, on June 30, 1880.

Acts of Parliament relating to the raising of Capital.	Description of Capital.	Standard Dividend.	Number of Shares issued.	Nominal Amount of Shares.	Called up per Share.	Total paid up.	Arrears of Calls.	Remaining called up and unused.	Total Amount authorized.
	A Ordinary stock	10 per cent.	..	..	..	£1,542,400	..	..	£
	A Preference convertible stock, 1st issue	5 "	..	..	..	1,750	..	..
The Gaslight and Coke Company's Act, 1863	Ditto, 2nd issue	Ditto.	..	..	..	1,800	..	..	1,550,000
	A Preference convertible shares, 3rd issue	Ditto.	404	£10	£10	4,040	..	..
	A Ordinary stock	10 per cent.	..	..	..	492,030	..	..
The Gaslight and Coke Company's Act, 1872	A Preference shares, 4th issue	5 "	797	10	10	7,970	..	..	1,000,000
	A Preference convertible shares, 5th issue	Ditto.	50,000	10	10	500,000	..	..
The Victoria Docks Gas Act, 1857	A Ordinary stock	10 per cent.	..	..	..	100,000	..	..	100,000
The City of London Gas Company's Act, 1859	B Stock	4 per cent.	..	..	..	100,000	..	..	400,000
The Companies Act, 1862, as applied to the Western Gaslight Company, Limited.	A Ordinary stock	10 "	..	..	..	600,000	..	..	600,000
The Imperial Gas Act, 1854	A "	Ditto.	..	..	..	1,500,000	..	..	1,500,000
The Great Central Gas Consumers Act, 1851	C Preference stock	Ditto.	..	..	..	200,000	..	..	200,000
The Equitable Gaslight Company's Act, 1842	D "	Ditto.	..	..	..	300,000	..	..	300,000
	E "	Ditto.	..	..	..	165,000	..	..
The Independent Gaslight and Coke Co.'s Act, 1861	F "	5 per cent.	..	..	..	30,000	..	..	255,000
	G "	7 "	..	..	..	60,000	..	..
The Imperial Gas Act, 1860	H Stock	7 "	..	..	..	325,000	..	..	325,000
The Imperial Gas Act, 1869	Ditto	Ditto.	..	..	..	975,000	..	..	975,000
The Gaslight and Coke Company Act, 1876	A Ordinary stock	10 per cent.	..	..	..	200,000	..	..
	Ditto.	Ditto.	..	..	..	..	..	800,000	1,000,000
						£7,465,000	..	£800,000	£8,265,000

No. 6.—RESERVE-FUND ACCOUNT.

Balance, June 30, 1880	£165,162 13 8	Balance, Dec. 31, 1879	£162,420 8 10
		Interest on amount invested	2,376 11 0
		Net revenue	10,365 13 10
	£165,162 13 8		£165,162 13 8

No. 7.—INSURANCE-FUND ACCOUNT.

Balance, June 30, 1880	£77,770 8 1	Balance, Dec. 31, 1879	£76,588 7 4
		Interest on amount invested	1,182 0 9
	£77,770 8 1		£77,770 8 1

No. 8.—DEPRECIATION-FUND ACCOUNT (FOR WORKS ON LEASEHOLD LANDS).

Balance, June 30, 1880	£14,349 8 11	Balance, Dec. 31, 1879	£13,392 7 6
		Amount brought from revenue account for the half year	750 0 0
		Interest on amount invested	207 1 5
	£14,349 8 11		£14,349 8 11

No. 9.—STATEMENT OF COALS USED, ETC.

Description of Coal.	In Store, Dec. 31, 1879.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, June 30, 1880.
Common	Tons. 126,729	Tons. 519,964	Tons. 559,147	Tons. 601	Tons. 83,942
Cannel	19,092	41,493	46,241	25	14,921

No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

Description of Residual.	In Store, Dec. 31, 1879.	Made during Half Year.	Used in Manufacture during Half Year.	Sold during Half Year.	In Store, June 30, 1880.
Coke—chaldrons*	34,175	712,686	190,509	547,967	8,385
Breeze—chaldrons*	5,468	29,004	3,900	67,911	2,461
Tar—gallons	504,898	6,743,976	..	6,876,093	462,781
Ammoniacal liquor—bushels of 108 gallons	21,102	177,399	..	190,849	7,652

* Under "Weights and Measures Act, 1878."

No. 11.—STATEMENT OF GAS MADE, SOLD, ETC.

Description of Gas.	Quantity Made.	QUANTITY SOLD.			Total Quantity Sold.	Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Thousands.					
Common	Thousands. 3,970,359	Thousands. 296,831	Thousands. 3,673,528	Thousands. 3,970,359	Thousands. 76,376	Thousands. 3,687,186	Thousands. 312,142		33,963
Cannel	308,107	12,803	260,858	273,661	1,994	275,655	27,432		2,492

GENERAL BALANCE-SHEET.

Dr.	£ s. d.	Cr.	£ s. d.
To Capital—		By Cash at Bankers	137,021 5 9
Balance at credit thereof (Account No. 3)	439,123 5 7	Amount on deposit at interest	200,000 0 0
Net revenue—		Amount invested	
Balance at credit thereof (Account No. 5)	456,336 2 8	Reduced Three per Cent. Consols	165,162 13 8
Reserve-fund account—		Three per Cent. Consols	77,770 8 1
Balance at credit thereof (Account No. 6)	165,162 13 8	New Three per Cent. Consols	14,549 8 11
Insurance-fund account—			
Balance at credit thereof (Account No. 7)	77,770 8 1	Stores on hand, viz.—	
Depreciation-fund account—		Coals	83,195 3 4
Balance at credit thereof (Account No. 8)	14,349 8 11	At low prices, we hope to have a much better account on this head to give you at the next half-yearly meeting. The gross cost of our coal during the past half year was 15s. 9d. per ton, and in the corresponding period of last year it was 15s. 8d. That is a saving of 8d. per ton on the gross cost; but when we come to compare the absolute net produce of our coals, and take into account the profit we make from those coals by means of the manufacture of our residual products, we find that the coal this year only cost us 5s. 6d., while in the corresponding period of last year the cost was 8s. 2-60d., thus showing a very considerable profit upon our present mode of working up our residuals. Our bad debts are what they generally are—there is no increase or decrease; and considering some of the ground we cover in lighting London, some of the very worst parts of the town, where debts are somewhat difficult to be gathered in, I think this is extremely satisfactory, and very creditable to our collectors. You will be anxious to learn as to how our capital stands. To our advantage we now have lenders out for £50,000 of our uncalled capital. This we expect and hope will produce a very considerable sum of money, a great portion of which will be in the nature of premiums, on which we shall have nothing to pay in the way of interest or dividend. I believe that this measure will be a very great boon to the Company by-and-by. Before the year 1878 I think it very probable that a further issue of capital will be necessary for the extensive work we are carrying on at Beckton and other places, where we are making great improvements; and upon this money we hope also to receive a very large premium. The amount of money now at our disposal, including the working of the last half year and the sum we carried over from the preceding half year, amounts, after paying the 11 per cent. dividend, to £186,650; and out of that amount the surplus of £47,000 belongs to the last half year's working, which I think is most satisfactory—as satisfactory as any Proprietor could possibly desire. I am glad to say that from the increased credit which the Company are acquiring by our successful operations, and by the due payment of all that we owe in every quarter, we are now able to raise money at, and convert money already raised to a low rate of interest. I may mention that in the year 1878 we saved 1 per cent. on £400,000; in the next year we saved on £60,000; and during the past year we saved 1 per cent. on £400,000. This all added together means by-and-by a considerable sum; for, of course, you are aware, if you read the accounts, that our indebtedness on debentures and mortgage bonds is very considerable indeed. The arrangement we are now making has this further advantage—that these moneys are raised in perpetuity; and can be no alteration in the interest, and we are certain of the amount just as if the gentleman who took it was a Shareholder of the Company. I do not know that I have much further to say; but I would make a remark or two as to the great success which has attended our residual products manufactured at Beckton, and which will not give you any ground for fault-finding operations at Beckton which we have done. Since we first undertook the construction of, I grant, the very expensive buildings at Beckton, to carry out the	
Balance at credit thereof (Account No. 9)	439,123 5 7	Arrears outstanding	392,160 6 8
Reserve-fund account—			23,188 19 2
Balance at credit thereof (Account No. 10)	456,336 2 8	Loke and other residual products	32,331 8 3
Insurance-fund account—		Sundry accounts	810 16 4
Balance at credit thereof (Account No. 11)	77,770 8 1	Retiring allowances	33,142 4 7
Depreciation-fund account—			4,757 0 0
Balance at credit thereof (Account No. 12)	14,349 8 11		
Debit interest for amount due to June 30, 1880	30,515 3 11		
Bond interest for amount due to ditto	6,540 0 0		
Preference dividends for amount due to ditto	9,059 9 0		
Unclaimed dividends	5,723 12 2		
Sundry tradesmen and others, for amount due for coals, stores, and sundries	132,542 9 9		
Benevolent-fund	1,621 9 5		
	1,446,284 9 2		1,446,284 9 2

The GOVERNOR said: Ladies and gentlemen, in rising to move the adoption of the report and the reception of the accounts, which you all have in your hands, it becomes my duty to state, in the first place, that never since I first had the honour of addressing you at these meetings has it been my duty to mention a subject of greater or more solemn regret than has happened since we last met. I really will not allude to the merits of that great man Mr. Evans, as my kind friend Mr. Vaughan Richards has undertaken to speak on the subject later on; and I confess myself totally unable to expatiate on it. The next question in our report is a very disagreeable one, no doubt. It relates to the explosion which took place about a month ago near Tottenham Court Road. Now, I must beg the Proprietors to place confidence in the Court of Directors, and leave this matter in their hands to be arranged as best they can. We have not admitted any liability, though liability may be attached to us. This subject has been to settle this matter as little to the detriment of the interests of the Proprietors as we possibly can. At all events, I can assure you that whatever be the amount of the damages which may ultimately have to be paid, they are a mere "myth" as compared to what has been stated in the public press and among individuals. They have put down this explosion as likely to cost the Proprietors a very large sum—an enormous sum; indeed, some of them go to any amount—as high as a million. The Directors, however, as far as they have gone into the subject, are satisfied that it will be a comparatively small amount, and it will all be paid, if we are obliged to pay anything, out of the insurance-fund, and in no case will it touch the dividends of the Proprietors in the future. It is an old saying that "accidents will happen in the best regulated families;" and however good the management of a company may be, there is a probability—at least, a possibility—of certain accidents occurring almost periodically. For instance, in the last half year, we have had to account to the Court of Directors for the explosion which took place at Tottenham Court Road, and, during the half year under consideration, only five accidents, exclusive of the Tottenham Court Road explosion. I think the Proprietors will agree with me that in such an enormous concern, where so many people have to be employed, this account is rather satisfactory. On the last occasion of our meeting I alluded to a Bill brought into Parliament by the Corporation of London, which, in many of its provisions, was extremely prejudicial to the London Gas Companies in general, and, as it happened, particularly so to the interests of this Company. That Bill, without absolutely going into Parliament, we objected to, and we opposed it before the proper authorities in the most determined manner we possibly could. I am happy to say that all the parts of the Bill to which we objected have been withdrawn, and the Bill as it stands now to receive the Royal Assent in Parliament is one that is not unsatisfactory to the Directors of this Company. The next paragraph in our report is the shortest perhaps that many of you gentlemen have seen in any report. It refers to the subject of our working during the last six months, a slight sketch of which I will, with your permission, give you. During the last half year we have carbonized 605,388 tons of coal, being the largest amount ever consumed by the Chartered Company, and exceeding that of last year by 1000 tons, which is amply accounted for by the increase of gas made and sold. The gas made last half year was 10,634 cubic feet per ton of coal. That, as compared with the corresponding period of last

year, is a considerable increase—about 24 per cent., and the rental you will see presently has increased in the same ratio, which shows that the coal has been well carbonized, and everything that could be has been obtained from it. The coke, I regret to say, we have not recouped ourselves for. We come very near to what we were last year, and I am glad to say, as to our prospects on this head, that having rid ourselves of a great many of our large surplus stocks of coke during the past six months, and disposed of a great many of our largest contracts, which at low prices, we hope to have a much better account on this head to give you at the next half-yearly meeting. The gross cost of our coal during the past half year was 15s. 9d. per ton, and in the corresponding period of last year it was 15s. 8d. That is a saving of 8d. per ton on the gross cost; but when we come to compare the absolute net produce of our coals, and take into account the profit we make from those coals by means of the manufacture of our residual products, we find that the coal this year only cost us 5s. 6d., while in the corresponding period of last year the cost was 8s. 2-60d., thus showing a very considerable profit upon our present mode of working up our residuals. Our bad debts are what they generally are—there is no increase or decrease; and considering some of the ground we cover in lighting London, some of the very worst parts of the town, where debts are somewhat difficult to be gathered in, I think this is extremely satisfactory, and very creditable to our collectors. You will be anxious to learn as to how our capital stands. To our advantage we now have lenders out for £50,000 of our uncalled capital. This we expect and hope will produce a very considerable sum of money, a great portion of which will be in the nature of premiums, on which we shall have nothing to pay in the way of interest or dividend. I believe that this measure will be a very great boon to the Company by-and-by. Before the year 1878 I think it very probable that a further issue of capital will be necessary for the extensive work we are carrying on at Beckton and other places, where we are making great improvements; and upon this money we hope also to receive a very large premium. The amount of money now at our disposal, including the working of the last half year and the sum we carried over from the preceding half year, amounts, after paying the 11 per cent. dividend, to £186,650; and out of that amount the surplus of £47,000 belongs to the last half year's working, which I think is most satisfactory—as satisfactory as any Proprietor could possibly desire. I am glad to say that from the increased credit which the Company are acquiring by our successful operations, and by the due payment of all that we owe in every quarter, we are now able to raise money at, and convert money already raised to a low rate of interest. I may mention that in the year 1878 we saved 1 per cent. on £400,000; in the next year we saved on £60,000; and during the past year we saved 1 per cent. on £400,000. This all added together means by-and-by a considerable sum; for, of course, you are aware, if you read the accounts, that our indebtedness on debentures and mortgage bonds is very considerable indeed. The arrangement we are now making has this further advantage—that these moneys are raised in perpetuity; and can be no alteration in the interest, and we are certain of the amount just as if the gentleman who took it was a Shareholder of the Company. I do not know that I have much further to say; but I would make a remark or two as to the great success which has attended our residual products manufactured at Beckton, and which will not give you any ground for fault-finding operations at Beckton which we have done. Since we first undertook the construction of, I grant, the very expensive buildings at Beckton, to carry out the

£190 to £194—which I should think might take at £194, with brokers expenses and commission—there is a considerable difference between that and £184; but you must deduct the £5 10s. you have now to receive for dividend, and that leaves the market price £189, as compared with what is offered to you at £184. I cannot help thinking that this is a pleasant margin, and one of which you will be glad to avail yourself. I shall be glad to see you at your fair price, and it will pay you £5 19s. per cent. as long as the Company pay 11 per cent. dividend. I believe there are stocks—such as Honduras, Peru, Egyptians, and Turkish—which promise more; but, unfortunately, they confine themselves to the promise. I think any one who prefers those stocks to that of The Gaslight and Coke Company will regret, at the expiration of the year, that he has not taken the other. I am, my dear Sir, ever, as I am bound to be, most respectfully, your obedient servant, J. B. GUTHRIE.

Mr. PRICE, at the risk of being corrected, said he thought nine months, not six months dividend had to be considered in looking at the market price of the stock.

Mr. JACKSON pointed out, with regard to the remarks of the Deputy-Governor, that there were round the room many portraits which had managed to pass the Auditor.

THE DEPUTY GOVERNOR: Allow me to correct Mr. Jackson. There was an attempt, I believe—it was before my time—to have that picture [indicating an oil painting on the wall] of Mr. Beck paid for out of the funds of the Company; but the Public Auditor put his foot down—not on the picture (laughter) but on the proposal to pay for it out of the Company's funds. That portrait [pointing to another painting] of the unworthy individual [indicating the portrait of Mr. Beck] was paid for by the State. The portrait of the present Governor, behind me, was presented by the Governor himself, and the Public Auditor had nothing to do with it.

Another SHAREHOLDER was understood to make an inquiry respecting the electric light, but his remarks were drowned by various "oh's," and no reply was given to them.

The GOVERNOR put the motion for the adoption of the report, and it was carried unanimously.

The SECRETARY read the dividends proposed, and
On the motion of the GOVERNOR they were approved.

The GOVERNOR then proposed a resolution authorizing the Directors to dispose of such further portion of the Company's property as is not now required for the purposes of their undertaking.

The DEPUTY-GOVERNOR seconded the motion, and it was carried unanimously.

On the motion of Mr. PRICE, a resolution was passed expressing, on the part of the Shareholders, condolence with the widow and family of the late Mr. Evans at the loss they had sustained.

Mr. PRICE next moved a vote of thanks to the Governor, Deputy-Governor, and Directors, referring to the excellent manner in which gas companies generally are managed.

The motion was seconded, and carried unanimously.
The GOVERNOR: On the part of my brother Directors and myself, I most

The Chairman said that on the part of my brother Directors and myself, I most cordially thank the honourable gentleman who so gracefully proposed this motion, and the meeting for having passed it so unanimously. Be assured that no stone shall be left unturned, as to the recent explosion or any other momentous matter, and that we shall give our attention to everything with an earnest desire to serve the Proprietors in general.

The proceedings then terminated.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held on Thursday, the 29th ult.—the Rev. Dr. PHELPS in the chair.

The SECRETARY (Mr. W. Peed) read the minutes of the previous meeting and the reports of the Directors and Manager:—

The Directors herewith transmit to the Shareholders a statement of accounts for the half year ending Midsommer, 1880, which accounts have been duly audited.

The Directors recommend a dividend for the half year, after the rate of 10 per cent. per annum on the consolidated stock, and after the rate of 7 per cent. per annum on the

Of the third call of £2 per share on the new shares, payable on the 24th of June last, the sum of £3802 was paid to the Treasurer prior to the day appointed for payment; but at the request of the Directors, with a view to simplify the accounts, this sum was held over by the Treasurer until after the close of the past half year.

The Directors, acting on the advice of Mr. Hawksley, are building a new retort-house similar to the one erected last year on the site of and to replace the old retort-house, which was in a ruinous condition, and has been removed. To defray the proportion of the cost of this work chargeable to capital account, and to pay off part of the balance due from the capital account, it is proposed to take powers to raise, under the Company's Act, the sum of £10,000 on mortgage of the undertaking, and a resolution authorizing this loan will be submitted to the meeting.

The retiring Director is Mr. Dennis Adams, who is eligible for re-election.
The retiring Auditor is Mr. Edmond Foster, who is eligible for re-election.
The Directors refer the Shareholders to the Manager's report hereto annexed.

The report of the Manager (Mr. J. Weeks) was as follows:—

In presenting my report for the half year ending at Midsummer, I beg to say that the new works have been brought into full operation, and are found in all respects satisfactory. The rebuilding of the old retort-house is being proceeded with as quickly as possible, to meet the wants of the coming winter. The illuminating power, pressure, and purity of the gas have been kept to the required standard.

The CHAIRMAN moved that the reports be received and entered on the minutes.

Mr. ALLEN seconded the motion.
Mr. FRENCH asked if the Directors report as to the raising of £10,000 on mortgage was included.

The CHAIRMAN said Mr. French was aware that a very large expenditure had already been incurred in extending the works. The report of the

Manager presented at the last meeting mentioned that there must be no delay in reinstating the old works. The Directors had acted on this recommendation, and on that of their eminent Engineer, Mr. T. Hawksley, and had proceeded to replace the old works by splendid new ones of the same character. Some money must, of course, be raised for this expenditure, but the Directors thought, the interest on the Company's debt was the best way to raise part of it by loan, according to the powers given them by their Act of Parliament. Before the meeting separated, Mr. Hawksley, who had come down to inspect the works, would, no doubt, give the Shareholders a full account of his opinion of their affairs. The Directors then adjourned, and the dividends recommended in the Report were declared.

On the motion of Mr. S. PEED, seconded by Mr. D. ADAMS, it was agreed to raise on mortgage £10,000 to defray the cost of the new works.

The retiring Director and Auditor having been re-elected, the CHAIRMAN, before calling upon Mr. Hawley for his remarks, observed that he did feel with other gentlemen that the Company was making a very large expenditure. Ten thousand pounds was not a trifle, but he thought that the account their Engineer would give them of their works, would show the reasonableness of everything the Directors had done. He was sure that the Company's Secretary, Mr. Jackson, took no one-sided view, but that they had the interests of the Company at large and also of the public at heart. It had been his care on all occasions to

express the Directors wish to do everything they possibly could to improve the Company's business.

the Company, and I felt quite flattered to be called upon to speak on this occasion, and the more so because he had learnt from the report much that was favourable to the interests of the Company. Nevertheless, he felt some difficulty in saying anything, and his difficulty arose from this cause—namely, that at the present moment the Company were placed in a position which was not altogether a desirable one. The directors were called "Assessment Companies;" but they were peculiarly the enemies of all companies, and for this reason, that when they found their expenditure increasing, they did not like to raise the rates in the pound, because they would make them very unpopular. So they looked round for some other way of raising the rates, and they found that they did not like to lower the rateable value of private houses in the pound, because thereby they would touch the wrong pockets. Therefore they beat about, and they would say, "There is a railway company, there is a gas company, there is a water company, and there is a bridge; and if a gas company, a water company, or a bridge would be in the position if he told the present committee about their undertaking, the gentlemen on the Assessment Committee would try to turn what he said to their own advantage. If he said anything of a desponding character, the Shareholders would go away thinking that they would not be able to pay the rates, and they would not like to suffer a diminution of their dividend. Therefore, looking at all the circumstances, and having himself to appear before the Assessment Committee, and probably afterwards in court, on his behalf, he must be as reticent as they would be pleased to allow him to be. He might, however, say that the Company were not in a position to undertake any new undertaking, both structurally and as a manufactory, was going on as well as it possibly could do. The Company were doing their duty to the town; they were getting a reasonable amount of profit out of a moderate charge for their gas; and they were making those improvements which would be necessary for the town, and which would be necessary for them during the next eight or ten years. He had looked into their capital account, and he did not find it to be by any means inordinate. He had looked into their revenue account, and he found that their revenue was one that would enable them to replace out of it the value of all the improvements which they were making, and that they might commence a renewal, and, therefore, they might rely upon this, that so far as the pulling down of any parts of their own undertaking was concerned, the value of the pulled-down part was properly allowed for in their revenue, so as not to become an inordinate charge on the capital. Looked at in this way, he thought that the Company were in a position which was somewhat greater, for every pound expended and charged against their capital account, than was the case with the generality of undertakings of the kind. Therefore he thought they were at this moment in a very prosperous condition, and he could assure them that nothing was more his wish than to see them in a position to maintain their prosperous position as Shareholders. After the new works had come into operation, and the charges relating to pulling down were paid, they would be able to give the public a share in the prosperity of the undertaking. He thanked them for hearing him so far, and said, he should now be glad to answer any questions which they might have, and if it was in his power to do so.

Mr. C. BATES proposed a vote of thanks to the Chairman, remarking, in doing so, that the Shareholders had every confidence in the Directors.

MR. LYON seconded the motion, and it was carried unanimously.

THE CHAIRMAN briefly acknowledged the vote, and moved that the thanks of the meeting be given to Mr. T. Hawksley for his attendance and address. With reference to the Assessment Committee, that body had, he said, a high duty to perform towards the town, but he had no fear that they would not take a just view of the question before them, and he hoped the Company and the Committee would arrive at a satisfactory conclusion on the matter.

The vote of thanks was then passed to Mr. Hawksley, and the proceedings terminated.

YORK UNITED GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held on Thursday, the 5th inst.—Mr. J. E. TAYLOR in the chair.

The SECRETARY and MANAGER (Mr. C. Sellers) read the notice of meeting, and the following report on the Company's operations during the past six months:—

The Directors have pleasure in placing before the Shareholders the accounts of the Company for the half year ending June 30, 1880. The increase in the consumption of gas is smaller than usual, at the same time the balance of profit is satisfactory.

The amount available is £7364 4s. 1d., and out of this sum the Directors have carried £1000 to the reserve-fund account, and with the remainder they propose to pay the usual rate of dividend of 5s. per share upon the old shares, and 1s. 6d. per share, or 5 per cent. per annum, upon the new shares, free from income-tax.

[illegible]

The Chairman, in moving the adoption of the report, observed that balance-shares were generally not very popular, though he believed there were many persons who carefully compared item with item in corresponding half years, and the Directors were quite satisfied that whatever scrutiny was brought to bear upon the accounts would be justified. He pointed out, however, that the dividend which the Shareholders were to receive had been earned. They would observe that the Directors had not yet availed themselves of the power given them by their Act of Parliament. They could not do this until they had called up a certain amount of money, and he pointed out that the Directors were now disposed to exercise their powers for any money they might want during the half year, and so to borrow £5000. The report stated that the new works had been begun. The gasholder would be constructed large enough to contain 750,000 feet of gas, which was nearly twice the size of the largest gasholder in the country. The Directors adopted this plan because they could construct the holder more cheaply, in consequence of the larger area, and they also thought it would be necessary to the future requirements of the Company. Another important matter was that the new gasholder would be situated on the new site, and not for two or three half years the subject of the conveyance of coal through the streets. In the past half year the streets had been relieved, and the Company had their coals from the new siding at the Cattle Market. They now proposed to have a siding of their own from the new works, and they also intended to construct a bridge across the

Foss, and thus also connect the old works directly with the branch railway to the Foss Islands. This would be a great advantage, as it would enable them to receive and deliver all their goods by rail. The Railway Company had treated them very fairly, and the City Council also had much to do in a business-like and liberal spirit. The Company were not going to build an ugly bridge, but one of an ornamental as well as serviceable character. The scrappers referred to at the last meeting had been put in operation, and had worked exceedingly well, and earned their cost. This necessitated the provision of more room for the reception of the residuals, and another tank was being added. He thought the Shareholders would see the necessity there was for going to Parliament for an increase of their powers, when he told them that in 1864 their make of gas was 14 million cubic feet, and in the year ending June 30 last it was 280 millions, so that they had more than doubled their production in sixteen years. It was most gratifying that the policy which the Directors adopted, and which the Shareholders so well supported, as to an increase of their works was absolutely necessary. As to revenue, they had had a moderately fair half year. One item in the accounts referred to a matter which had been long talked about—namely, doing away with ladders, and lighting the public lamps by means of a rod. The carrying out of this operation had entailed an expense of £200 on the half year, but this would, of course, not occur again. Having referred to the sale of coke, which had been very satisfactory, the Chairman said the Shareholders would observe that £1000 had been taken to the reserve-fund, and it must be satisfactory to them to know that the reserve could thus be increased. The Directors' congratulations on the Shareholders on the Company's prosperity during the past half year, and hoped the current half would be equally prosperous.

The LORD MAYOR (Alderman Milner) seconded the motion, and it was carried unanimously.

On the motion of the CHAIRMAN, seconded by the LORD MAYOR, the dividends recommended in the report were declared.

On the motion of the CHAIRMAN, seconded by the LORD MAYOR, the following gentlemen were re-elected Directors for the ensuing year, viz:—G. Brown, P. Bulmer, J. L. Foster, W. F. Hargrove, J. Holtby, W. Leak, J. Pearson, H. Prestor, H. Sotherton, J. P. Taylor, W. Valey, and W. W. Wilberforce.

Alderman MELROSE then proposed a vote of thanks to the Chairman and Directors for the efficient manner in which they had conducted the Company's business during the past half year. He thought the unanimity with which every resolution proposed by the Chairman had been received showed that the Shareholders as well as the public had the greatest confidence in the Directors of the Company. All that they had done tended in the right direction, and he felt quite sure the Shareholders had every confidence in them, and that the money they spent would be judiciously laid out.

Mr. J. DALTON seconded the motion, which was unanimously agreed to. The CHAIRMAN acknowledged the compliment, and the proceedings terminated.

YORK NEW WATER-WORKS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held on Thursday, the 5th inst.—Mr. J. F. TAYLOR in the chair.

Mr. J. HOLCROFT (Mr. J. P. Wood) read the report of the Directors, as follows:—

The Directors have the pleasure to report that the extended works at Acomb Landing are now completed, and enable the Company to meet all the requirements of the public. It was a great gratification to them to receive so large a number of the Shareholders on their recent inspection of the works.

The Directors recommend that a dividend of 5s. per share on the preference shares, being at the rate of 5 per cent. per annum; a dividend of 8s. per share on the ordinary shares, being at the rate of 8 per cent. per annum; a dividend of 5s. per cent. on the 1st shares, 1875, and dividend of 6d. per share on the new shares, 1879, being at the rate of 5 per cent. per annum; for the half year from the 1st of January to the 30th of June last, be now declared, and that the same respectively be paid without deduction for income-tax.

A vacancy having occurred in the office of Treasurer of the Company, in consequence of the lamented death of Mr. Arthur William North, the Directors, have to report that they have appointed Mr. J. F. TAYLOR to the vacant office of Treasurer and Manager of the York Union Banking Company, Treasurer of this Company in his place.

The Directors much regret to have to report the death of Dr. Procter, a Director of the Company. They have been in the habit of sending the thanks of the Company to him in consequence of the vacancy in the office of one of the Auditors by the resignation of Mr. Feltow, another Auditor will have to be elected, and the Directors beg to suggest Mr. William Henry Cobb, of Clifton, York, as a suitable gentleman to fill that office.

The CHAIRMAN, in moving the adoption of the report, referred with satisfaction to the satisfaction of the Directors. He said the Directors had hoped in the present half year to finish all the claims which might be made upon them. They did not expect to make any call this half year, as they had sufficient money in hand to meet all the requirements of the contractors as to outstanding liabilities. He thought they might safely say the capital account was as nearly as possible closed, and the dividend would not be in need of much. He expressed deep regret at the death of Mr. North and Dr. Procter, who, he said, had rendered valuable services to the Company.

Mr. J. L. FOSTER seconded the motion, which was carried.

The recommendations contained in the report were then confirmed, and a vote of thanks having been passed to the Chairman and Directors, the meeting closed.

REIGATE GAS COMPANY.—The annual general meeting of this Company was held on Saturday, the 31st ult.—Mr. John Payne in the chair—when the Directors reported that the extraordinary dividend for the last year in the price of gas to the rate of 6d. per 1000 cubic feet, the clear balance of this year available for dividend is £2235 18s. An interim dividend of 5 per cent. having been paid in January last, there remains a balance of £1482 19s. Of this sum, the Directors have pleasure in recommending to the Shareholders the payment of a further dividend of 5 per cent., together with a bonus of 2 per cent. (free from income-tax), and that the balance of £408 6s. 6d. be carried forward." The CHAIRMAN having moved the adoption of the report and accounts, Mr. Joseph Steele criticized various particulars of them—especially the salaries and commissions paid. He then acknowledged that the Directors had taken a step in the right direction in altering the title of Mr. C. R. Mead from "Managing Director" as he had previously been called, to "General Manager," and urged them still further to reduce the Company's expenditure for management. The retiring Directors (Messrs. F. Bugden and H. Austen) and the Honorary Auditor (Mr. G. Dalton) were re-elected, and it was resolved that a professional Auditor of the accounts should be appointed. The balance of profit and loss account was £2217 3s. 10d., the total expenditure being £3708 13s. 4d., of which £1896 7s. 11d. was represented by the net cost of coals used in manufacture during the year. The sales of gas and meter rentals realized £4510 5s. 6d.; products and sundries, £1212 9s. 6d. These sums, and the balance brought forward from 1879, raised the credit total to £5925 17s. 2d., and left the balance this year, as stated above, at £2217 3s. 10d. The Company's capital consists of £14,510 in £10 shares; and besides this there are 549 shares on which £1 only has been paid.

COLNE VALLEY WATER COMPANY.

The Thirteenth Half-Yearly General Meeting of this Company was held at the Charing Cross Hotel, London, on Friday, the 6th inst.—Mr. J. R. HOLLOM, M.P., in the chair.

The Chairman (Mr. W. Tord) read the notice convening the meeting, and the following report of the Directors was taken as read:—

The Directors beg to present their half-yearly report and statement of accounts to the Shareholders of the Colne Valley Water Company.

They are glad to be able to congratulate the Shareholders on the steady progress of the Company, which has enabled them to show a profit for the past half year of £139 7s. 11d.

The gross revenue from water-rates and meter-rents during the half year shows an increase of £40,384 3s. 4d. as compared with the corresponding period of 1879.

The number of consumers is steadily increasing, and the works are all in good repair.

Capital.		Capital Account on June 30, 1880.		Ca.	
150 shares, at £10 per share, paid up	£1,500 0 0	£100,000 0 0	Expenditure as per last statement ending June 30, 1880	£122,010 3 11	
60 new shares, at £10 per share, paid up	600 0 0	600 0 0	Expenditure for half year ending June 30, 1880	77 11 10	
Debentures	23,900 0 0	23,900 0 0			£123,087 15 9
			Balance carried to general balance	3,512 4 3	
		£125,600 0 0			£125,600 0 0

Revenue Account for the Half Year ending June 30, 1880.

Revenue Account for the Half Year ending June 30, 1880.		Revenue Account for the Half Year ending June 30, 1880.		Revenue Account for the Half Year ending June 30, 1880.	
Engine working expenses—		Water-rates	£1,501 18 2	Rent of water-meters	47 10 3
Fuel	£13 8 10	Rent of water-meters	47 10 3	Transfer fees	3 0 0
Oil	8 17 1	Transfer fees	3 0 0	Sale of gravel and refuse lime	28 11 2
Tallow	4 12 1				
Waste	2 17 5				
Sundries	0 4 9				
Wages	207 0 5				
Engine repairs	10 12 6				
Pipe system expenses and repairs	60 11 0				
Lime	65 5 4				
General working expenses and repairs	68 17 7				
Stable expenses	13 2 11				
Motor repairs	3 3 10				
Salaries to secretary and other officials	123 6 0				
Rent, office, stationery, and printing	3 5 6				
Sundries and petty expenses	15 9 10				
Law expenses	4 15 10				
Commission to Collector	34 10 10				
Rates and taxes	16 0 6				
Bad debts	29 13 6				
Interest on debentures, &c.	662 10 0				
Profit	159 7 11				
	£1,661 9 0				£1,661 9 0

The CHAIRMAN, in moving the adoption of the report, reminded the Shareholders that when they last met he was able to say the Directors considered it probable that on the next occasion of their meeting they would be able to show a profit on the Company's operations. He was glad to say that this expectation had been realized, there being a profit of £139 7s. 11d. on the past half year's working. He might say that the Directors were sure this profit would be permanent, and that the Company, having once "turned the corner," would progress more rapidly than it had hitherto done. There had been some considerable increase in the water-rates obtained by the Company. The total sum receivable, including interest on the water-rates now being laid on, would amount to £3260 per annum. He did not mean to say that the Company had received half of this amount, because a number of these supplies were now being laid on, and some were only laid on in June. They therefore had not actually received the sum he had named; but this was the total of the supplies now receivable by the Company had supplied rather more than half their district, but there were still 1500 houses unsupplied. The number of houses to which water had been laid on during the half year was 115, representing a water-rental of £248 per annum. Last half year a number of large houses had been empty, and because of these they had not received the same extent as formerly. One satisfactory point to the Directors during the half year they had, at the small additional cost to the engine working expenses of £3 odd, pumped, in round figures, 7½ million gallons more water than before. He thought this was satisfactory, as it showed that with scarcely any appreciable cost they had been able to increase the supply. They had had a number of persons who had always been. He had seen Dr. Frankland's reports for 1879, and he was able to show that the Company's water stood really at the head of all the London Water Companies. These were the only points to which he had to draw the Shareholders' attention.

Dr. TATHAM inquired whether there were several bad debts, or was the whole amount owing to the builder referred to.

The CHAIRMAN replied in the affirmative, and reminded Dr. Tatham that he (the Chairman) had said the Directors had taken precautions in future against such debts, as the supply was to be paid for in advance.

Dr. TATHAM asked whether the Directors had any plan of supplying the Company's water into the Metropolitan area, or whether they intended to trust to the Company's own neighbourhood. The analyses of the water, he said, showed it to be the purest in the neighbourhood of London, and he thought it should be more generally known; and if it were, advantage would accrue both to the public and the Company.

Mr. MORRIS expressed a hope that the prosperity of the Company would continue. He said that it was not only due to an increase of the rates, but also to the economies which had been effected. Might the Shareholders hope in future that those reductions would continue, or must they not rather expect an increase in the rates? He said that the increase of pumping was required before long, in consequence of the increased quantity of water now being taken, or was the present engine-power sufficient for a considerable time to come? Were the reservoirs sufficient for the district as it filled up? Would the Company be affected by the new assessment? The amount appearing for interest on debentures, &c., would come to rather more than £1000 per annum, so he presumed that the remainder was for interest on the temporary loan of £1600, which apparently would give 5 per cent. interest for it. According to the present value of money in the market, 5 per cent. appeared unusually large. He saw in the accounts an item for sale of gravel and lime, and he wished to know whether the Directors were establishing a new market for selling their refuse lime, instead of disposing of it only casually, as before.

The CHAIRMAN, in reply, said the Directors were quite alive to the importance of the question of the general water supply, and the desirability of extending the Company's water into London, and they were watching

with very great interest all that was being done in the matter. With respect to Mr. Monro's remark on the economies which had been effected, perhaps owing to the Directors having given up the London office and a small office they had at Edgware. They had every reason to believe that the money so saved would be a permanent economy, as he did not suppose it would be necessary to take to either of these offices again. As to the salaries, he could only say that the increasing work of the Company did not at present seem to require any special advance, but of course salaries did increase in time. With regard to the pumping, he believed that the present engines would be sufficient for a long time to come. They were equal to pumping a great deal more than at present. The Company might charge for their water according to the new assessment. As to the interest on the loan, it was a matter of convenience to the Directors, and was only advanced for a time, but they were looking forward to the time when they might pay it off. The £85 which appeared in their profits as from the sale of gravel and refuse lime entirely arose from the sale of gravel. The Directors believed this would continue, but they had not been able to establish a regular market for the refuse lime.

Mr. J. B. CAPEL seconded the motion, and it was carried unanimously. Mr. Monro then moved a vote of thanks to the Chairman and Directors, whose labours he commended.

Mr. TAYLOR seconded the motion, and it was carried unanimously. The CHAIRMAN briefly replied, and the proceedings terminated.

LEEDS CORPORATION GAS SUPPLY.

At the Meeting of the Leeds Town Council last Wednesday—the MAYOR (Alderman Tatham) presiding—the question of reducing the price of gas, which the Gas Committee had decided to recommend (see *ante*, p. 184), came up for discussion and settlement.

Alderman BOWER, the Chairman of the Gas Committee, moved—"That the price of gas be reduced from 2s. 2d. to 1s. 10d. per 1000 cubic feet, such reduction to take effect from the 1st of July, 1880." He said he had real pleasure in moving the resolution, as the estimate for the year ending June 30, 1881, drawn up by the Engineer and Secretary jointly, showed a balance, after reducing the price of gas, of £5503. The estimates which had been brought before the Council for some years past had been always more than realized—the surplus had been, in every case, double the amount that had been estimated. He thought, therefore, he was not taking too extravagant a view of the matter when he said that the surplus which was estimated would be realized, and even exceeded. There were two items which had materially increased. For tar the estimate for the year ending June, 1879, was under £15,000; in the year ending June last the amount realized from tar would exceed £30,000. The estimate for the year was £10,000, and he thought they would now realize that amount. For ammoniacal liquor the estimate in 1879 was £14,880, and for the coming year it had been estimated at £40,416. During the last two or three years the Committee had spent not less than £40,000 in the renewal of their plant, none of which had come out of capital. The Committee acted on the safe principle of keeping down their capital account, and had been renewing their plant out of revenue. The Committee were of opinion that the gas ought to be produced of the best possible quality, and before they had any idea that Mr. Spark was that day going to bring the subject forward, they, on the 26th of July, passed a resolution "that the Engineer be instructed forthwith to adopt means of reducing the sulphur impurities in the best article for the use of the public. He was sure that no one having the choice would prefer impure gas at 1s. 10d. per 1000 cubic feet." He felt sure that the Committee were truly persuaded of the necessity of dealing most carefully with the sulphur impurity.

Mr. NICHOLSON seconded the motion. Mr. SPARK moved, as an amendment—"That the price of gas for the year ending June 30, 1881, be retained at 2s. 2d. per 1000 feet, and that the balance of profit be applied for the following purposes:—1. Increasing the illuminating power of the gas to 17½ candles, tested by a 15-horse Argand burner. 2. Reducing the sulphur impurities to the lowest practicable point, and that the maximum be 20 grains per 100 cubic feet. 3. Abolishing meter-rents." He said he wished the Council to adopt the principle that instead of having an apparently cheap gas, it should be of better quality. The main idea in transferring the manufacture of gas to corporations was that they should not seek to make a profit out of its supply, but should produce the best article for the use of the public. He was sure that no one having the choice would prefer impure gas at 1s. 10d. per 1000 feet before pure gas at 2s. 2d. per 1000 feet. With regard to the meter-rents, he submitted that the smaller consumers paid beyond what was a fair price, although there was no principle that he could discover on which such charge was made at all.

Mr. SCARF said that the Gas Committee had been ill-used and misrepresented. They were represented to be giving a cheap gas at the expense of its purity; but nothing further from the truth could be asserted. Various places were mentioned as supplying gas more free from impurities than the Leeds gas; and in order to test the matter, the Committee sent the Borough Analyst to test the gas in those places. The result was that in every case where he applied the test the gas was more impure than in Leeds. The Committee had spent £20,000 within the last few years on purifying apparatus, and yet they were told that they had no right to make a charge on the cheap gas, so that the same was determined that it should be as pure as London gas and as cheap as any in the country.

Mr. CARTER here moved that the Council adjourn, and that the subject be brought forward at the next meeting.

Alderman MARRAS seconded the motion, but it was negatived. Alderman GAUNT said he did not see why the Committee might not reduce the price of gas 2d. per 1000 feet, and apply the other 2d. proposed to be taken off in purifying the gas.

The members of the Council having spoken, The Mayor asked whether the proposed resolution and the amendment were prepared to accept the suggestion made by Alderman Gaunt.

Alderman BOWER said that the Committee would have sufficient money in hand, after reducing the price as proposed, to purify the gas. He thought that if the amendment were adopted it would be equivalent to a vote of want of confidence in the Committee, who had been told to spend money unless they believed that some benefit would be derived from it, but now they were fully prepared to act.

The Mayor said that with the consent of the Council Mr. Spark wished to alter the terms of his amendment to the following:—"That the price of gas for the year ending June, 1881, be reduced from 2s. 2d. to 2s. 0d. per 1000 feet, and that the balance of profit be applied to the following purposes:—1. Increasing the illuminating power of the gas to 17½ candles, tested by a 15-horse Argand burner. 2. Reducing to a practical minimum the sulphur impurities of the gas, the maximum to be 30 grains per 100 cubic feet."

This amendment was put and negatived; whereupon

Mr. EMBLEY moved—"That no reduction be made in the price of gas until it is made more pure and of greater illuminating power."

Mr. HARRIS seconded this amendment, which was also negatived. Then the vote was taken on the original resolution, and resulted in its being carried by 15 votes to 10.

BURNLEY CORPORATION GAS SUPPLY.

The statement of accounts of the Gas Department of the Burnley Corporation for the nine months ended March 31 last, just issued, shows that there was expended during that time, on capital account, a sum of £8319 7s. 9d., making the total to date £119,179 7s. 11d., and leaving a balance of capital in hand of £2976 17s. 4d. The accounts are prefaced by the following "general data," prepared by the Gas Engineer (Mr. Samuel Petty Leathley):—

Gas made	149,325,000 cub. ft. = 9225 cub. ft. per ton.	
Gas sold	137,605,000	= 9160 " " "
Gas unaccounted for	11,519,700 cub. ft. = 765 cub. ft. per ton.	or a loss of 7.711 per cent.
Average illuminating power during the nine months		15.23 candles.
Coal and canal used in the nine months		15,041 6 tons.
Coal made per ton of coal used		1,830 lbs.
Coal used as fuel per ton of coal used		339 lbs.
		or 29 p. ct. of coke made.
Tar made per ton		174 lbs.
Ammoniacal liquor made per ton		294 lbs.
	Per Ton of Coal used.	Per 1000 Cubic Feet Sold.
Cost of coal and canal	10s. 11.36d.	1s. 1.92d.
Value of residuals	7s. 1.90d.	0s. 9.37d.
Net cost of coals, &c.	2s. 11.66d.	0s. 3.89d.
Net working expenses	12s. 0.67d.	1s. 8.79d.
Expenditure for gas	15s. 0.35d.	1s. 7.68d.
Interest and sinking-fund	3s. 10.92d.	0s. 3.06d.
Total cost of gas	18s. 11.26d.	2s. 0.75d.

Do.—Revenue Account, for the Nine Months ending March 31, 1880.

	£	s.	d.	Cost per Ton of Coal.	Cost per 1000 Cubic Ft. Sold.
To Manufacture of gas—					
Coal and canal, including carriage, unloading, and all expenses of depositing same on works	7,620	8	1	10 1.565	1 1.272
Fuelling materials and wages	640	13	7	10 0.220	0 1.116
Wages and gratuities at works	2,182	12	2	2 10.818	0 3.801
Repairs and maintenance of works and plant, including renewal of rotors, machines, apparatus, tools, materials, and labour; less old materials sold.	4,101	17	10	5 5.486	0 7.144
Distribution of gas—					
Salaries of Meter Inspectors and Assistants	192	11	9	0 3.076	0 0.335
Repairs, maintenance, and renewal of mains and service-pipes, including materials, laying, paving, and labour	215	0	5	0 3.437	0 0.375
Repairing, renewing, and refixing meters	237	6	0	0 3.786	0 0.413
Public lamps—lighting and repairing	323	10	4	0 5.161	0 0.563
Rent, rates, and taxes	111	15	7	0 1.783	0 0.195
Rates and taxes	570	2	7	0 9.095	0 0.993
Management—					
Salaries of Town Clerk, Accountant, Clerks, &c.	412	3	3	0 6.025	0 0.723
Collectors	169	19	0	0 4.664	0 0.529
Stationery and printing	84	17	1	0 1.354	0 0.118
General establishment charges and incidentals	39	19	0	0 0.637	0 0.070
Auditors	15	12	6	0 0.249	0 0.027
Total expenditure	17,314	5	5	23 0.217	2 1.254
Balance carried to profit and loss account	7,066	16	8	10 1.345	1 6.148
	24,821	2	1	33 1.555	3 7.402

Cr.—Revenue Account.

	£	s.	d.	Per Ton of Coal.	Per 1000 Cubic Ft. Sold.
By Sale of gas—					
125,175,386 cubic feet within the borough, at 2s. 5d. per 1000, less discounts	16,386	12	1	—	—
934,150 cubic feet outside the borough, at 4s. per 1000	186	17	10	—	—
Public lighting and under contracts	1,599	18	8	—	—
	18,173	8	1	24 1.912	2 7.651
Rental of meters	1,020	12	9	1 4.282	0 1.777
Residual products—					
less labour and cartage	1,724	2	0	2 3.504	0 3.003
Tar	1,932	5	9	2 6.833	0 3.345
Ammoniacal liquor	283	9	0	0 4.522	0 0.494
Subsidy of ammonia, less cost of manufacture, &c.	1,380	5	1	1 10.018	0 2.204
Spent lime	64	17	3	0 1.035	0 0.113
Rent	64	0	0	0 0.021	0 0.111
Sale of water	7	10	0	—	—
Profit on fittings, &c.	268	8	10	—	—
Discounts	2	5	4	0 4.346	0 0.484
Total receipts	24,921	2	1	33 1.555	3 7.402

FORFAR CORPORATION GAS SUPPLY.—A Bill to authorize the raising of further capital by the Forfar Gas Commissioners has just passed the Commons, and been sent up to the House of Lords. It is in the form of a Provisional Order Confirmation Bill under the General Act for the prevention (Scotland) Act, 1862. The Order recites that the gas supply of the burgh was transferred from the Forfar Gaslight Company and vested in the Town Council by the Forfar Gas Act, 1871, by which the latter body were authorized to borrow on mortgage £5000 for the purposes of the undertaking, this sum being liquidated by a sinking fund to be set aside at the rate of not less than £150 per annum. The demand for gas steadily increases, and the Town Council are now under the necessity of improving, extending, and enlarging the gas-works; and for this purpose propose to borrow a further sum of £4000. This amount is allowed by the Provisional Order, and the sinking fund raised to £2710 a year; while the original mortgagees have priority over others to be issued under the powers of the aforesaid Act when passed.

THE RECENT EXPLOSION OF GAS NEAR TOTTENHAM COURT ROAD.

We have received from the Board of Trade the following report by Mr. A. G. Vernon Harcourt, one of the Metropolitan Gas Referees, as to the recent disastrous gas explosion in the district of the Chartered Gas Company, he having been instructed by the Board to attend the inquest on the bodies of the two men who were killed on the occasion, and to report generally on the subject:—

17, Buckingham Street, Adelphi, W.C., Aug. 3, 1880.

The Assistant Secretary, Railway Department, Board of Trade.

Sir,—In accordance with the request contained in your letter of the 9th inst., I attended the adjourned inquest into the fatal accidents caused by the explosion of gas in the Tottenham Court Road.

The evidence given on that occasion and on the first day of the inquest left no doubt as to the immediate cause of the accident. The jury arrived at the following verdict:—"We are of opinion that Albert William Beavis and William Burr met their deaths by an explosion of gas, such explosion being caused by a light being ignorantly placed to a stand-pipe by the foreman Hawkes, gas having been introduced into the new main by some defect in the valve in Howland Street. We are further of opinion that additional care should be taken by The Gaslight and Coke Company in the testing of new mains."

I enclose herewith a full report of the proceedings at the adjourned inquest, from the JOURNAL OF GAS LIGHTING for July 30.

After the verdict had been read by the foreman of the jury, the attention of the jury was called both by the Coroner and myself to the only point in the above statement of the cause of the accident which seemed questionable. No evidence had been given to show that a valve of the size placed upon a 36-inch main could be expected to work absolutely gas-tight. It was also possible that the valve had at some time been opened after a while closed again, or that it had been imperfectly closed. A lock-gate which allowed water to turn the valve here and there would not be described as having some defect in it. It was explained by one of the jurors that they intended no more by the expression "some defect in the valve" than to state that it was through the valve that gas had entered the main. Subject to this explanation, I would venture to express my entire concurrence in the verdict.

Since the inquest, having been requested to report to the Board of Trade upon the circumstances of the explosion, I have obtained some further information from Mr. T. C. Hersey, Chief Inspector of The Gaslight and Coke Company, and from Mr. J. Clark, Manager of the Kiup's Cross station of the same Company. The following are the points which deserve attention:—

1. The mode of connecting a new main with one charged with gas.
2. The testing of the soundness of the new main.
3. The formation of an explosive mixture of gas and air.
4. The employment of a light in testing for gas.
5. The several explosions at outbursts.

1. The Mode of Connecting a New Main with one charged with Gas.

Although, in my opinion, the responsibility for the explosion and the destruction caused by it rests almost exclusively upon the ignorance or thoughtlessness of the contractors foreman, the explosion would also have been averted if the connection in Bayley Street had been made before that the gas which exploded may have found its way into the new main from the earth in which the main was laid, in the same manner in which a subsoil drain becomes filled with water. This would, no doubt, be possible with a leaky main in the neighbourhood of another leaky main as well. But in the present case, as will appear, the main was all but gas-tight, and no evidence was given of the presence of gas in the subsoil in sufficient quantity to inflame or explode. Unless the atmosphere of the subsoil contained gas in sufficient proportion to form an explosive mixture, such a mixture cannot have passed from it into the main.

As will appear from the consideration of the small amount of leakage sufficient to produce an explosive mixture, there is no reason to doubt that the gas which exploded entered from the valve in Howland Street. Probably, therefore, no accident would have occurred if the connections in the immediate neighbourhood of the valve at each end of the new main had been deferred till last.

If the main had been laid only one or two lengths beyond the valve and then plugged, a pressure-gauge attached to a stand-pipe would soon have shown even a minute leakage in the valve. This could not be the case with a main laid in the present conditions. The reasons are:—(1) that the pressure shown is that due to the presence of gas in the leakage at the valve and the leakage in the main; (2) that the time required for the accumulation of any given pressure within the main is directly proportional to its capacity.

The danger of plugging a short length of main of large diameter into one end of which gas was slowly leaking from a valve, would be inconsiderable. Such a length would soon cease to contain an explosive mixture, the rate of ventilation greatly exceeding that of leakage. In the present case the leakage had charged 690 yards of main with an explosive mixture. If no plug had been applied in testing, and the main had been unplugged, the explosive mixture would have streamed outward from the upper part of the main, and several hours probably would have needed to elapse before the risk of explosion by the accidental application of a light to the mouth of the main had passed away. Mr. Hersey stated at the inquest that he had seen gas accidentally lighted by a spark from a pick. As, however, the small amount of leakage in the main does not once have given warning, the actual risk in this case would have been very small.

2. The Testing of the Soundness of the New Main.

The main valve method had been tested four days before the explosion by pumping air into it, and observing the gauge the pressure produced. Half an hour's pumping produced a pressure of 2 feet of water. The gauge, which showed a gradually diminishing pressure, was read at intervals during the following days. Below are tabulated the observations of the pressure-gauge, furnished by Mr. Hersey, together with the corresponding barometric readings obtained from the Kew diagram:—

Date.	Time from First Observation.	Water-Gauge.	Barometer.
Thursday, July 1, 11.30 a.m.	0 hours.	21	29.63
Do, 8.30 p.m.	9	21	29.67
Friday, July 2, 7.50 a.m.	20.3	3	29.77
Do, 12.30 p.m.	25.0	5.75	29.75
Saturday, July 3, 8.0 a.m.	44.5	3	29.7
Monday, July 5, 7.0 a.m.	91.5	0	30.15

No exact expression for the leakage of the main can be obtained from these data, owing to the small number of observations, and the uncertainty how much of the air pumped in escaped through leaks in the main into the soil at the atmospheric pressure, and how much passed through

the valve into the main in Howland Street. The operating pressure for the former leakage, that shown by the water-gauge for the latter, the difference between this and the pressure of the gas in the Howland Street main.

The following table gives the actual volumes of gas (using the word in its generic sense) which escaped during each interval, corrected to 30 inches barometric pressure, and on the assumption that the temperature of the main underground did not vary during the four days:—

Interval.	Leakage.	Initial Pressure.	Final Pressure.
9 hours.	317 cubic feet.	24 inches.	14 inches.
11.3	207	14	7
4.5	55	7	5.75
19.5	134	7	7
47	110	3	0

It will be seen at once that the above leakages from a main whose length was 690 yards, and capacity 14,680 cubic feet, are not large. Down to a pressure of 7 inches of water the rate of leakage is expressed by the formula $l = 1.42 p$, where l is the number of cubic feet escaping in any interval of 10 hours, p the pressure shown by the water-gauge at the closed end of the main, and l the number of cubic feet escaping. The observed leakages were less than those calculated by this formula, as should be the case if part of the leakage occurred under the pressure p , and part, through the valve, under the pressure $p - p'$; p' being the pressure of gas in the main in Howland Street.

On the same day on which the above testings of the length of main which exploded were commenced, a similar testing was made of another section of the same main extending eastwards from Tottenham Court Road to Goswell Road. The length of this section was 2770 yards, or about four times that of the western section. The pressure within this closed main was raised by pumping in air to 14 inches of water, and after a few hours it had fallen only 1 inch. Since the pressure when the western section was tested must have fallen nearly 3 inches during the first two hours, and the rate of decrease of pressure would have been the same in the two cases if, as was likely, the average leakage per unit of length of main had been the same, the difference has probably shown the fact that the valve in Howland Street was less tight than the plugs which closed the other ends of both sections.

The testing was a testing at once of the main and of the valve, and the manner and number of the observations do not furnish sufficient data for calculating separately the leakage in the main and the leakage through the valve.

The total rate of leakage at lower pressures, as far as it can be inferred from a curve drawn through the points observed, may be illustrated by the following example. In 10 hours the pressure would have fallen from $\frac{3}{2}$ to $\frac{1}{2}$ inches, and in 35 cubic feet of time would have escaped 35 cubic feet. If the valve was absolutely gas-tight, this was a leakage of little more than 0.5 cubic foot per hour per 100 yards of main. If the main was absolutely sound, the leakage at the valve for the above pressures was at the rate of 3.8 cubic feet per hour.

From the comparison of the leakage in the two sections of the main it seems probable that about two-thirds of the total leakage occurred at the valve. The pressure in the Howland Street main averaged $1\frac{1}{2}$ inches. Hence the average rate of leakage at the valve may be roughly estimated at 1.4 cubic feet per hour. It is dependent, however, as will be shown, upon various causes besides those here taken into account.

3. The Formation of an Explosive Mixture of Gas and Air.

A main filled with air, which is connected by a small aperture with a main carrying gas, will become charged with a mixture of gas and air in proportions depending upon (1) its capacity, (2) the interval of time, (3) the rate of leakage. Under the conditions of the present case, the factors are, (1) the pressure, and variations of pressure, in the main from which gas is escaping; (2) the degree of soundness of the main into which gas is escaping; (3) its changes of temperature; (4) the size of the aperture; (5) the fluctuations of atmospheric pressure.

Where, as in the present case, the main is nearly gas-tight, the connection between it, the leakage in cubic feet per hour, l , the interval of time in hours, V , the capacity of the main in cubic feet, and n , the proportion of gas in the mixture, may be expressed by the equation—

$$\frac{l}{V} = n + \frac{n^2}{2}$$

Experiments are wanting upon the maximum and minimum proportions of coal gas of different qualities which form explosive mixtures with air when the gaseous mixture is at rest, and in sufficient bulk for the cooling influence of the containing vessel to be infinitesimal. But it may be inferred from experiments made in tubes of comparatively small diameter that combustion would not propagate itself in a mixture containing more than one-fourth or less than 1.15th of "common" coal gas. Hence no explosion can occur when $\frac{l}{V}$ is greater than 0.251 cubic foot, or less than 0.065 cubic foot.

When a connection has to be made in such circumstances as the present, l and V are known; and the probability of the main containing an explosive mixture is measured by the probability that the capacity of the main is such as to be charged with a mixture of gas and air of the degree of soundness to be expected from large valves, the risk of encountering an explosive mixture can thus to some extent be estimated beforehand. In the present case it was only improbable that the main should contain an explosive mixture in whatever degree, it was improbable that the average rate of leakage from the valve should have reached 1 cubic foot per hour, and not have exceeded $\frac{3}{2}$ cubic feet.

In estimating probable leakage, it is important to bear in mind the conditions already enumerated as affecting it when the leakage occurs from a main charged with gas, at pressures exceeding by a small amount varying amounts the atmospheric pressure, into a main nearly gas-tight and of large capacity. The subject is too extensive for treatment in this report; but it is worth noting that not only has the flow of gas to be considered which would occur if the closed main were sufficiently defective for the tension of the contained gases to vary with the atmospheric pressure, but also the case of admixture which operates more strongly the freer the closed main is from other leaks.

First of all, the daily variations of gas pressure from 1 inch up to 3 inches cause a passage of gas into the closed main until, if the leak and the period of higher pressure be sufficiently long, the capacity of the main, the tension of mixed air and gas approaches that of the gas in the charged main. When pressure is taken off, the tension in the closed main may for a time exceed that of the gas, and a mixture of air and gas will pass out. Thus by periodical inspirations and expirations the closed main will receive a continually increasing proportion of gas even when it is surrounded the whole time with air, with the direct inflow due to the excess of pressure in the gas-main. The same result occurs at irregular

periods, and often under higher pressures in consequence of the variations in the tension of the atmosphere.

4. The Employment of a Light in Testing for Gas.

The ordinary practice for testing for a leak in a gas-pipe by applying a flame is serviceable and free from danger, provided it is confined to the ordinary case of an escape of gas under pressure, and in a position in which the accumulation of gas mixed with air can have resulted from the escape. But to test in this manner the contents of a main which was left full of air, but which gas might have entered, was an act of extraordinary ignorance or thoughtlessness. Hawkes, the contractors foreman, who had been occupied all his life in pipe-laying, made the almost incredible statement that he was not aware that a mixture of gas and air was explosive. If so, the critical operation of unplugging a main which might be filled with such a mixture ought not to have been left to his superintendence.

It was, no doubt, desirable to ascertain before unplugging the main whether its contents were harmless. If the gauge had been removed before the pressure had sunk to zero, the small of the issuing gas would have given an indication of its nature, or a bladder might have been filled at the stand-pipe and tested at a distance. The gauge being level, a sample of the contents of the main might have been withdrawn by a pump. All that can be said for testing with a light at the stand-pipe is that the chance of explosion is rather less than if a light had been applied at the mouth of the main immediately after the removal of the plug. The inflammation of a mixture of gas and air in a pipe of small calibre depends not only upon the composition of the mixture, but upon the calibre and material of the pipe, and upon the flow of gas within it. If the tension of the gas within the main had been as great as that of the atmosphere—and it would have been—cases owing to the rise of the barometer during the preceding day if the test had been made earlier, and if some 110 cubic feet of gas or air had not leaked into the main—no explosion could have occurred, unless, in testing, the match were dipped into, and thus accidentally dropped down, the stand-pipe. Or again, if a pressure of a few tenths of an atmosphere had been maintained, the mixture might have burnt and given warning without the combustion travelling down the pipe against the stream of gas. Actually, the level gauge showed beforehand that the conditions were favourable for ignition through the stand-pipe.

5. The several Explosions or Outbursts.

The only loss of life which occurred was that of the two workmen in Bayley Street, where the first explosion took place. The inquiry before the coroner was hastily directed to the cause of the explosion at this spot. One witness, Sibley, a gas-fitter, stated that after witnessing the first explosion he heard a succession of "thuds" at intervals of about two seconds. No evidence was given by any eye-witness of the explosions in Charlotte Street or Percy Street. A knowledge of the interval of time between the explosions would be of great interest, and might determine the cause of the particular local outbursts.

If a period as considerable as two or three seconds intervened between one explosion and another, the hypothesis that the proportions of air and gas differed irregularly in different parts of the main would be necessary to account for the facts. A more probable hypothesis is that the limit of the propagation of combustion must depend upon the quality of the gas or a quick match. With this might alternate at intervals mixtures of gas and air in proportions in which combustion takes place more rapidly, causing explosion. But witnesses are apt to overrate the duration of any explosion which occurs, and the interval in this case may have been less than one second. It seems hardly possible that the variations in the composition of the mixture which this hypothesis requires can have existed in a main nearly gas-tight, into one end of which gas had slowly leaked, spreading by diffusion during 50 days until both the furthest end and the nearest were charged with an explosive mixture. Judging from the levels of the main above a datum line, the explosion which occurred, the course of the main is nearly horizontal, the greatest difference of level scarcely exceeding the diameter of the main. In such a main diffusion would be assisted by gravitation. Gas entering from the valve would flow along the upper part of the main in a stream of decreasing volume, gradually losing itself by diffusion into the main body. No connection appears to exist between the places of explosion and the levels of the main at those places. The greatest difference of composition must have been found between the mixed gases near the valve, whence the explosion first broke out, working an accumulation of coal gas at that point, and the gas at the furthest end, where the explosion took place. A less rapidly, permitting a considerable difference in the composition of the gaseous mixture, the result should have been a mixture just inflammable, but burning inexplosively at the Bayley Street end, changing by degrees into an explosive mixture, which should have ripped up the southern end of Charlotte Street, and again burning more slowly as the proportion of gas further increased.

Most probably the rate of diffusion had so much exceeded the rate of leakage as to have produced a nearly homogeneous mixture of gases. If the explosion, that is a very rapid combustion, of this mixture produced a bursting strain upon the iron pipes which confined the heated gases except in the neighbourhood of an opening through which the compressed gas could blow away, the result would be of this kind: After the first explosion the strain would increase as the fire receded from the open mouth, the rate of increase exceeding 100 yards per second, until a place was reached at which the strain exceeded the resistance. There an outburst would occur of the heated gases, relieving the strain, which would again increase, until relieved by a third outburst or explosion, and so on.

Thus the place of each outburst would be determined partly by its distance from the preceding outburst, partly by the resistance of the iron spot than at another of the iron pipe and of the earth packed around it. Apparently for a length of 800 feet in Charlotte Street the main was sufficiently strong to resist the tension of the heated gases.

That the outbursts named, another was in operation, which must have caused the explosive force to be greater at some points than at others. When the plug was blown out, a wave of compression was sent in the opposite direction along the column of gas, which must have rebounded from the bends in the main and from the valve which closed it. The return waves would meet the advancing fire, and at these points the strain would be greater from the heated tube being at a higher position. Each outburst would cause a fresh oscillation and fresh coincidences of the combustion with reflected waves of compression.

(Signed) A. VERNON HARCOURT.

CAMBRIDGE UNIVERSITY AND TOWN WATERWORKS COMPANY.—At the half-yearly meeting of this Company held on Friday, the 6th inst., a dividend on the consolidated and other stock of the Company was declared at the rate of 10 per cent. per annum. The Directors reported that they were taking steps to obtain an equitable reduction of the re-assessment of their works at £200, as contained in the Assessment Committee of the Cambridge Union. The present assessment is £1000. The Company's undertaking was shown to be in a satisfactory state.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

(Continued from p. 224.)

Mr. THOMAS WHIMSTER (Perth) read the following paper:—

ON THE USE OF "SPENCE'S METAL" FOR PIPE-JOINTING.

Fifteen years ago I had the honour of reading a paper on "Gas Main and Service Pipes" before this Association in this city. It seems to me that I had computed a mysterious cycle in life, and was beginning another round, which I can scarcely hope to complete. Then, as now, the desideratum was the getting rid of the ordinary lead joint, by having a satisfactory substitute, without the hard work necessary to make a good lead joint in large mains; and it is hard work—so hard that no mechanic would be got to do it. While you look on he will put in the gasket, put the clay round, and pour in the lead, but he will set a labourer to do the staving; so that, after many years' experience, I find it better to look out a smart labourer and leave him under the orders of the pipe-layer, who, though he will not do the hard work himself, will see that his assistant does it conscientiously. It is wonderful how conscience becomes a living power in a man when it has to superintend work done by another.

When I read my paper in 1875, it was my opinion that the "Robbins joint" was destined to supersede all other joints in underground main-pipes. I had a number of 3-inch pipes made on that principle, and laid only driving them home with the mallet, instead of the hydraulic jack, and they looked very well, and have not, to my knowledge, leaked to this day. But the invention was not properly pushed, I suppose, for no more was heard of it. You will find a notice of it in the JOURNAL OF GAS LIGHTING for Nov. 15, 1884 (Vol. XIII., p. 775).

I have said that this was my expectation then. Now it is "Spence's metal." I have always regarded the ordinary process of jointing pipes with lead as one which demanded the most jealous and unwearying watchfulness. It is trying to the wrist of the workman, and there is great temptation for him to scamper his work; it requires much time to do it well, and the pipe-layer, anxious to get along, hurries the man who is making the joint, perceiving that he is giving him a finishing touch in the track if they are not quite right. Thus defective work is, with the best intentions, allowed to pass.

One turns from this to the turned and bored joint, to find that it is only a modification of the evil. It may be that the turning and boring have been done in a more perfect labour, but the joint is still a joint, in which case lead has to be run into the recess in the front of the faucet. A faucet may give way in the driving, and a pipe must be cast aside in consequence, or a thimble applied. A pipe has to be cut to have a T-piece put on, and so forth; and, in each contingency, a lead joint must be made.

Spence's metal seems to be a remedy for all this; and to show that I am not alone in this opinion, I may state that the metal was only patented twelve months ago, and it is already being largely used all over the kingdom. With it there is no hard work, and the joint is made in about half the time required to make a lead joint. The joint is made out of a T-piece put in, or a thimble applied, there is no difficulty, half the time required to make a lead joint will do it. It has only one drawback to my knowledge, and that is, that the pipes must be dry, or the metal will not run.

On observing the notice of Dr. Cole's paper on this metal, read before the J. G. S. in February last, I wrote to Messrs. Spence, giving them information, and on receipt of their report for a sack of the metal, which reached me early in March. It was tried on a 3-inch pipe, as directed. The pipe was connected with a small gasholder, plugged at the ends, and tried with 3½-inch pressure, and found to be perfectly gas-tight. It was the support at the ends, and the faucet stem with heavy mallet, turned over, and struck again all round. The metal of the joint projected a little in front of the faucet, as is usual in lead joints, for the purpose of staving or caulking in, and this treatment made it break off. The gas was turned on, and the joint was found to be gas-tight. The pipes were then tried in the street, and rolled about over the ground, without injuring the joint. Since then we have had in Perth about 300 yards of pipes, ½-in., ¾-in., 1-in., and 1½-in. diameter, and we are to lay immediately about a mile of larger pipes, for the joints of which Spence's metal will be used. If the joint be properly made it is always tight. If not tight, it shows at once, and the only remedy is to pick it out and make it over. If it is not tight, the only remedy is to pick it out and make it over. It is very quick with a proper tool. The joint cannot be made without care, but there is no back-breaking hard work that would tempt a workman to scamper it, as in the case of the lead joint; and if not carefully made it shows at once.

With the pipes, all the preparation necessary is to see that there is no loose matter adhering to the spigot or faucet, and after the gasket is caulked in to see that no strands of it are left lying loose in the faucet. Should the pipes be old and rusted, a file should be used to have all the rust removed from the spigot and faucet, and a suitable hard brush, which can be made to order, used to make them clean. If this precaution be taken, and the pipes kept dry, a good reliable joint will be secured.

I may here note that there is a considerable shrinkage at the "gate," or pour, and if the joint be large there should be a little metal poured in, as it cools, to make up for shrinkage, and it should be probed while cooling to see how it settles into the shape of the joint. The metal, when the pieces should be stirred about until the whole is in a perfectly fluid state. Should it take fire, it should be lifted to the ground and stirred as it cools till in a state like melted tallow. A very short experience will enable any one to work it easily. I have had a heater made for it, with a glass cover, and the pipe has to be above the heater, and a round opening for the ladle or pot to sit in, and a lid to close down over all, to keep the metal clean.

In estimating the cost of jointing, I take a 6-inch pipe, and find that material and workmanship alone, with lead, will cost 1s. 6d., or 74d. per yard; and if made with Spence's metal, the cost will be 1s. 3d., or 74d. per yard. In larger sizes the extra cost of staving the lead will increase the difference.

This metal was patented in July, 1879, under the name of Spence's metal (Patent No. 2706), and it is described as a "mixing of sulphur with metallic sulphides." Mr. Spence, the patentee, at first made it from Wicks' pyrites, which contains lead, zinc, and iron, and a small amount of lead and zinc. He is now, however, using principally iron pyrites. In the manufacture the ores are reduced to a fine powder, and mixed with ground sulphur, in proportions varying according to the quantity of sulphur already contained in the ores. Its melting-point is 330° Fahr., and its weight about one-third that of lead.

Discussion.

The PRESIDENT said he was hardly inclined to place the metal against lead, which for pipe-joints had hitherto satisfied every requirement, and although he was not certain of the merits of the metal, he thought he would not be inclined to place his faith in it to the detriment of lead.

Mr. M'GILCHRIST said the only recommendation this new metal had, so far as he knew, was that it was cheaper than lead, which certainly was an important consideration, but it struck him the metal was too rigid, that in many cases where the pipe had to be severed from the fracture by the lead giving a little, if Spence's metal had been used it would have been

broken. That he thought was an objection to the use of the metal. He had not, however, the slightest doubt that if the metal was properly applied it would make a tight joint. Quite recently he visited the South Metropolitan Gas-Works, London, and had the pleasure of seeing a number of joints which had been made with this metal on 24-inch pipes. For several months these pipes had been subjected to a pressure of about 25 inches of water, and had not given way. He had thought, therefore, that Mr. Livesey had proved that Spence's metal was a proper material for making a tight joint. Time would tell whether the metal would prove a success or not. But there was another objection. Suppose, when laying main-pipes, rain commenced to fall—and in Scotland they could not boast of many fine days—the metal could not be used, and the result would be that the men would require to go about idle. Here the question of cost again came into consideration. The plain question to be answered would be whether, supposing bad weather must be taken into account, it would not be cheaper to pay for lead than to pay for men while time was unoccupied.

Mr. D. B. EVELIN (Forfar) said one feature of the paper struck his mind forcibly. Mr. Whimster stated that where an imperfect joint was formed, it must be cut out, and that was easily done. The facility to take out a joint seemed to him to tell against the value of the metal. Of course, an even continuous pressure might, to a certain extent, be good, but it must be remembered that the strain of every-day traffic was not continuous. It was a series of concussions, and he was afraid the very nature of this joint would, in the course of time, be against its resisting the concussions of traffic. But, of course, experience would tell this.

Mr. PRUDEN thought the paper was very much to the point, and asked, if the pipes at the South Metropolitan Gas-Works had been laid below a causeway at the usual depth, and subjected to the hammering process of traffic going over them, would they have been as tight as they were shown to be.

Mr. M'GILCHRIST said the metal seemed to make a tight joint under heavy pressure; but the very fear which had been expressed by Mr. Evelyn was one which he himself had. The pipes referred to had never been tested in that way.

Mr. A. SMITH (Aberdeen) asked how long a man would be occupied in taking out a defective joint, say from a 6-inch pipe.

Mr. J. HALL (Glasgow) said that the first time it came out he was much impressed with its value; but, though he gave it every chance, he confessed that either he or the metal was at fault. The difficulty he had to contend with was as to the melting. He thought it would require more capable men than were generally employed in gas-works to attend to the part of the operation which was the most important, and that if the joint would be destroyed. Another objection was that when the metal was used and re-used, the sulphur disappeared, and thus the metal became so much poorer. This could be easily tested by putting a piece of the metal on the fire. Then, as to lead joints, he had only to say that if a tight joint was obtained, it was a comparatively greater expense incurred in using lead should never be taken into consideration.

Mr. MITCHELL remarked that one of the bad qualities of the metal would seem to be the impracticability of using it in wet weather, and this was a great drawback to its general use. Lead was extensively used for repairing broken pipes; but supposing this new metal were used, and the weather were raining, had it any advantage of this metal, but it would protect the part from the rain, and this would be an annoyance. For himself, he did not see why so many lead joints should be used, when turned and bored ones could be employed. However, he thought the quantity of lead used in large works was of small importance when the question of tight joints was in issue. In laying pipes of considerable diameter inside gas-works, there might, however, be a saving by substituting the metal for lead. One point seemed to him to have been overlooked in the discussion so far, and this was that the lead used in a joint was not lost, as when the pipes were lifted the lead could be melted out of them.

Mr. YOUNG remarked that he had some experience of the use of sulphur pure and simple, and sulphur mixed with sand, ground brickdust, or other such matter as a pipe-jointing compound, which was extensively used in making joints in paraffin oil works. It very much resembled Spence's metal in all its physical characteristics. So long as the joints of the pipes were not subjected to a trial was allowed for, it answered completely. As, for instance, in the jointing of the vertical pipes in condensers, because there the pipe had liberty to expand and contract without strain being thrown upon the joints; but if the pipes were bound up at their ends and laid in long straight lengths, the expansion and contraction would be slight, and of temperature, it did not matter so much for, when they were thus rigid, and had not the opportunity of expanding and contracting, one of the joints (the worst, of course) yielded; and the continuance of this process of expansion and contraction ground the unyielding compound into a powder, and ultimately led to its being thrown out, and the destruction of the joint. But, even allowing that Spence's metal would hold a pipe quite rigidly, it could not, in his opinion, be exclusively employed, for it could easily be understood that, in a long line of street piping, laid during the summer months, when the pipes were expanded, a rupture must take place some time during the winter months; or, if it did not, the molecular change of the joints would be such that the joints would be rigidly, it must lead to the rupture of the material of the pipe itself. Therefore, if the metal were to be used, more particularly in long lengths of piping, where the pipes were bound hard and fast together, it would be necessary that expansion joints of some kind should be placed at distances sufficient to take up and relieve from the rigidity of the joints, and to draw the strain from this sulphur jointing. With reference to the liability of the material to be shaken out by traffic and yielding of pipes, &c., he thought the only danger would be that its fixeness would be too great, and this would lead to the fracture of the pipe jointed with it.

Mr. MACPHERSON said it was stated that when it cooled it expanded; but he thought this was a mistake. It was, in his opinion, owing to the rapidity with which the metal cooled that it was drawn to any cold surface, and he was perfectly certain that a vacuum in the centre was the result. The objection which was taken to the rigidity of the metal might be due to the fact that the metal was not rigid, but it would there was a great deal in what Mr. Young said in regard to them, but there was the same difficulty with reference to lead joints—they would draw too; although the pipe did not rupture, the result would be the same.

Mr. YOUNG: I wished to explain that if turned and bored joints were subjected to the same strain, they would simply draw out of the joint, and allow for the strain, whereas when a joint was bound by a material—and a material so rigid as this was—the result would be to draw the metal asunder. No doubt leakage would take place in both cases; but with the turned and bored joints, it would be less, because the strain would be spread over all the joints. Lead joints, on the other hand, yielded considerably without leaking.

Mr. WHIMSTER, in reply, said it had been remarked that the one recommendation of this metal was its cheapness. This was a mistake; it was not. It might be recommended for its strength, but it would be weight upon it. The question of cheapness as against leakage was not for one moment to be

considered. The breaking of such joints by the traffic over the street was purely conjectural, and it seemed to him to be unreasonable. He had suspended two pipes by the ends, and struck the joint with a heavy hammer in all directions. So violent was the treatment that the metal broke off that was projecting over the face of the faucet, yet the joint was perfectly good, and the roller of the street lamp was not injured. It was all sorts of jolting, and still the joint was perfectly tight. Surely such a test was sufficient to dispose of the objection which had been stated. Then again, while so much stress was laid upon breakage as against leakage, he would ask, was there a manager present who would not put up with the one instead of the other? Would he not rather take the risk of having a leakage than the chance of having an escape? As to the taking out of a joint, he fancied this could be done in two or three minutes. The allegation of the brittleness of the metal being against it was disposed of by the other fact, that a pipe could be shaken and rolled, and yet not break when struck. It might be said that the expansion of the metal was applied to it, yet even if it was in the joint there was no manner of treatment that he knew of which could injure it. If there was any dirt, or Smith's solution about the joint, it must be scraped away, as Spence's metal would not make a joint unless the iron was thoroughly cleaned. It was a simple matter to do this. What he objected to was the hot crust, making the lead joint. This caused the man to shirk the work. If the manager was looking on, a man might make a good enough joint; but the moment the overlooker's back was turned he would do it at the expenditure of as little care as possible. Then with reference to the turned and bored pipes, he (Mr. Whimster) considered they were exposed to the same strain as the pipes of the expansion and contraction of the metal. No doubt Mr. Young's theory was good, but it would be noticed that the expansion and contraction of a lengthened run of pipe was not a great matter. It must not be supposed that 100 yards of piping would expand only at one joint; it would yield at all of them. The expansion of the contraction took place, it might draw the pipes out a little, but so very little that he would trust to it. Of course he had had no experience in the matter any further than that no leak had yet been reported in any way. As to the remarks of Mr. MacPherson about the expanding of the metal in cooling, he thought it would be in his power to make the metal did not expand. He dealt with facts, and said that the metal shrank when ground into the joint. He thought the theory ought to be that the metal melted at so low a temperature, that the moment it came into contact with the cold iron it cooled, and while the molten metal in the centre was still pressing outwards, and into the pores of the iron, it cooled, and remained rigid, and therefore the shrinkage took place in the centre.

The President thought Mr. Whimster had made out a good case for the patentee, and if two or three years hence he could give the Association a paper stating that the metal had realized his expectations, they would all be greatly indebted to him.

Mr. M'GILCHRIST read the following paper:—

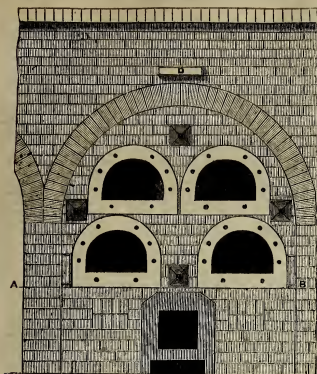
RETOURS AND RETORT-SETTINGS.

Mr. President and Gentlemen.—In the wide range of subjects suitable for discussion at our annual gatherings, there is one of more important character than the "Retorts and Retort-Settings." The success of any gas undertaking mainly depends upon the retorts being properly wrought; therefore I trust the importance of the subject will, no matter how crude or distorted my paper may be, beget a discussion of an instructive nature, that will clearly indicate that we are advancing towards a more complete mode of working our retorts.

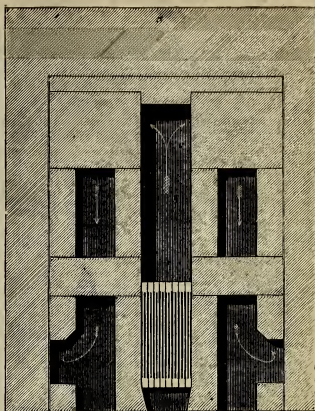
The carbonizing department being the most important in our industry, it is not somewhat strange that we should hold so many different opinions regarding the best section and size of retorts, and the most efficient means of heating them? Should the valuable time and money that has been expended in the past be thrown away, and we determine what is the most economical section and size of retorts, and the most efficient system of setting and heating them, not have found us at the present day working more in harmony with each other on this vexed question? I think gas managers should long before this have had fixed and standard sizes of retorts, and should have determined the best means for heating so large a number of odd sizes and shapes of these articles, as they cannot all be equally well adapted for their work. Our system of ordering retorts, all of different sizes, and all at the same season of the year, is not calculated to assist in the production of a first-class article; for the retort manufacturer never receives an order for a large quantity of retorts, upon which great demand, and he, consequently, often has to put on inexperienced men to complete an order in time; the result generally being an inferior retort, the demerits of which are discovered only when it is put into action, while its cost we can never tell. Now, with standard sizes of retorts, the manufacturer could be producing them all the year round, and not being pressed for time, it is only reasonable to suppose that he would be enabled to give us a much better article. The price of fire-clay retorts is a matter of altogether secondary importance to their quality. I merely mention this because I think the competition that has existed in this trade of late has not been in favour of our countrymen, and has been a great disadvantage to the means of acquiring the historical part of my subject, so I will not dwell upon it further than to refer to an invention, made in the first quarter of this century, of Mr. Maiben, of the "Fair City." This invention consisted of "a retort for distilling coal by exposing it to the action of heat in thin strata, and the retort was made of iron, and was reported to have obtained the best results of his time. We have no doubt greatly improved on his system of heating retorts; still I think we have, to our loss, forgotten the sound theory he laid down—"short-time charges;" for with short-time charges we not only get an increased quantity, but we also get a higher illuminating power of gas. It is no doubt a great discrepancy between laboratory and retort-house tests of coal are generally due to the difference in the time occupied in working off the charges.

And now with regard to the sections of retorts. I do not approve of either the round or the oval retort, because gas cannot spread the coal in either, and throughout the whole of the retort, and consequently bad results follow, for the outside of the charge is carbonized long before the core has been decomposed. I have heard those persons who are in favour of round retorts say that at the end of the charge the coal is all thoroughly carbonized; but this does not do away from the fact that the shorter time equally carbonized all the coal, and we all know the evil effects of over-heating working coal in the production of illuminating gas. It is impossible to get the best results from round retorts, for whenever coal is submitted to distillation in an unequal mass, the operation must be imperfect. The great object of the gas manufacturer is to obtain gas of the highest quality, and to do this he must use a retort in which he can accomplish better with flat-bottomed retorts than with any other form, for you can get the same quantity of coal that a round retort is capable of carbonizing, spread in a more even, thinner, layer in a D-retort of equal diameter, and this ensures what extensive experience has proved to be the best result. I prefer the D-retort to the oblong or square form, simply because there is less area of material

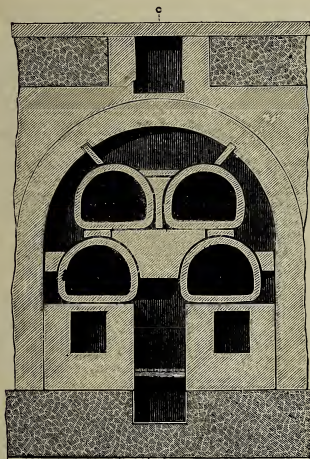
[D indicates the damper.]



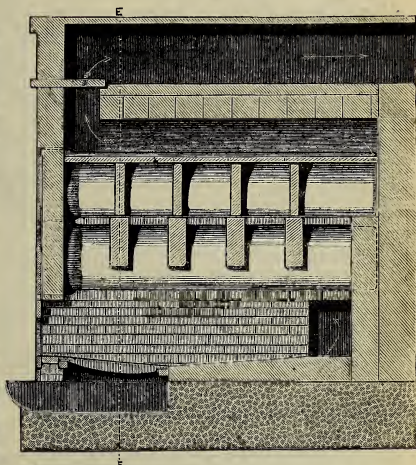
FRONT ELEVATION.



PLAN AT A, B.



TRANSVERSE SECTION AT E, F.



LONGITUDINAL SECTION AT C, D.

to heat in the arched roof. With round and D-retorts of equal diameter we get results similar to those obtained from carbonizing coal in large pieces in comparison to working it well broken up. It is often claimed for the round retort that it is stronger and will last longer than the D-shape, owing to the latter not being equally thick throughout. This is a theory untenable in actual working, for I have seen D-retorts work much longer than rounds of the same makers. The round retorts are generally made smaller than those of the D-shape, and of course will be stronger in consequence, and this, I think, will partly account for the theory I have referred to.

From 14 to 18 months is a satisfactory time for fire-clay retorts to be at work. If they are kept going much longer, I am afraid the results per ton of coal carbonized will not be very favourable. At the end of a second season's work I believe it will generally be found profitable to replace retorts, even although they could, by patching, be kept at work for another season. The price of a new retort can be lost in a very short time through an old one. A case in point will be found in the recent tests of the Foulis and West stokers at Manchester. The West stoker was wrought in connection with a bench of new retorts; the Foulis, on the other hand, did duty in connection with retorts that had been in use for a considerable time. Both were mechanical stokers, and both do the work of charging retorts equally well; but the cost of working one against the other was the question the Corporation of Manchester wished to determine, and in doing so they discovered that the new retorts of the same

size, &c., as the old ones gave results that pointed to the desirability of renewing retorts frequently in a decade. I believe the manager who can boast of working retorts for six winters gives himself a reputation without in any way adding to the fame of the manufacturer who supplies him with the retorts.

I consider that a retort should not be more than 3 inches in thickness; any greater thickness being attended with an unnecessary waste of fuel. I once saw three retorts at work that were 5 inches thick throughout, and were made by mistake. I have often thought that it would have been cheaper for the gas company to have paid for them, and broken them up when new for concrete work. The loss of fuel must have been very great in maintaining a good heat with them.

Several very successful gas engineers prefer and work brick-built retorts, owing to their durability being greater than that of fire-clay retorts; but I am afraid this durability is dearly bought, for to be stronger than ordinary clay retorts they must be thicker, and every half inch of additional material in a retort simply means so many tons of extra fuel per year to maintain this surplus material at a high temperature. Again, I prefer the well-made clay retort, because you can, with a little attention, prevent any considerable thickness of carbon from gathering within its smooth interior, by simply scraping it every day for the first week it is at work, and by continuing the process once a week thereafter. Now, it is impossible to get such a smooth surface in a brick-built retort. A rough surface facilitates the deposition of carbon, and this can

only be removed by burning it out; which means not only the loss of the retort for a shift or two, but also the loss of a considerable quantity of gas.

As to the length of the retorts, I think there is a great loss of fuel and labour in many gas-works, owing to the retorts being less than 9 feet long. I worked D-shaped retorts 30 in. by 15 in. by 8 feet long, and obtained, when using coal yielding 9500 cubic feet to the ton, about 7000 cubic feet per mouthpiece per day. I increased the length of the retort by 1 foot, and obtained an increase of 1200 cubic feet per mouthpiece per day, without any additional cost for labour, and using little, if any, extra fuel.

After studying Mr. Young's theory of radiant heat in connection with the manufacture of gas, I am of opinion that although vertical retorts are well adapted for the application in their working of the cheapest force in nature—gravitation—they are altogether unsuitable for the manufacture of gas.

If I had written this paper before your energetic Secretary fixed the title, I would have stopped short at "retorts," for I find more could be said about them than time permits.

The latter part of my subject—"Retort-Setting"—to be treated justly, would require a series of papers; so I will not take up your time by noticing any of the regenerative furnaces so popular on the Continent, and so much talked of in the gas world at the present time. I will only refer to the settings used in Scotland for carbonizing cannel, and listed by me in my book of 1874. To show the diversity of settings, I will mention those adopted in the following well-regulated gas-works:—

In Paisley, two brick-built D-retorts are set in one oven; in elevation the one retort is placed above the other.

In Galeshiels and Perth, three brick-built D-retorts are set in triangle form, with two top furnaces under the bottom retorts.

In Dundee, three and five clay D-retorts are set with one furnace.

In Edinburgh and Leith, both Companies set five round retorts to two furnaces; in elevation two are set above a line of three retorts.

In Greenock, five clay D-retorts are set similarly to Edinburgh, with two furnaces to each oven.

At Temple Farm, Maryhill, four brick-built D-retorts are set with one furnace. (The setting used in Dumbarton, shown in the annexed diagrams, is heated on the same principle as the Maryhill setting. It has four flues more than mine, and requires about 1 foot more retort-house floor.)

In Coatbridge, five clay D-retorts are set to one furnace; in elevation the retorts are set two and two and one.

In Glasgow, six and seven clay retorts, D-shaped, are set with one furnace; in elevation two, three, and two. In the setting of six retorts the centre one is omitted.

Advocates of all the foregoing settings can say something in favour of each. One claims durability for his; another, no difficulty in keeping up good heats; another, saving of fuel; another, convenience for stoker's work; another, cheapness of construction; another—and not the least important one was omitted—access to the flues or outside of retorts, to them as may be required. No setting is of much account that has not the foregoing points to recommend it.

It must be evident to all practical men that the various settings I have referred to are not, and cannot be equally well adapted for economical working. There must be one setting better than the others, and the point for us to determine is, What is the setting best adapted for the economical production of gas? Seeing that we cannot afford to erect at our works experimental settings of every kind we hear about, with the view of discovering the most efficient for our requirements, I hope this meeting will not be slow to express its opinion upon the setting found to be the most beneficial; for the sake of our workmen, and the service to each other, and the Association to which we belong will ever prosper while free expressions of opinion are given at its meetings upon all subjects brought forward for discussion.

There is, I may mention, a setting of two retorts very popular in some of our smaller ovens, and, although it has done good service in its day, is, in my opinion, now behind the times. The setting I refer to has a retort set on each side of the furnace; the flame passes from the furnace to the crown of the arch, where it is divided and passes over the crown of the retorts, descends, and passes along either one or two flues under the crown of the retorts, and off to the chimney. Mr. Mitchell's setting of two retorts already referred to—the one set above the other—is far the more preferable of the two, for in it you have only about half the space and oven area to heat; besides, in this system the heat is more directly applied to the bottom of the retorts, where the greatest absorption of heat takes place, and where the most heat is required. By Mr. Hislop's setting, in comparison to the one referred to, there is not only a great saving of fuel effected, but considerably less retort-house gas is required, and this is of the greatest importance in many small gas-works, where the settings are as I have described, and the retort-house is considered too small. I have no doubt the adoption of Mr. Hislop's setting would give at least 33 per cent. more carbonizing power, without increasing the size of the retort-house. The setting of three retorts to one oven, as wrought in Dundee, gives excellent results so far as the quantity of gas produced per ton of coal carbonized is concerned; but requires a great deal of space, owing, I presume, to the unproductive space that requires to be heated in the ordinary oven of three retorts, as Mr. Mitchell informed us at our last meeting, is 30 per cent. higher than the quantity required in the same works to heat an oven of five retorts to one furnace. I believe that the settings in Galeshiels, Perth, Edinburgh, Leith, Greenock, and Aberdeen, having two furnaces to settings of three and five retorts, will give as good results as either of the other two settings already referred to—viz., the two in Paisley or the three in Dundee—with regard to the production of gas. But the quantity of fuel used must be to maintain equal heats very much larger than that required to heat a well-ranged setting of either four, five, or six retorts to one furnace.

We all know that when the furnace is being cleaned a large quantity of cold air, regulated by the draught of the chimneys, rushes in, and accordingly robs the retorts and brickwork of heat. With two furnaces to one oven we double this unnecessary evil, for I hold that a smaller furnace requires to be cleaned at less frequent intervals. To avoid this evil, when clinkering, I think an easy working damper, to shut off the draught when cleaning the furnace, might be profitably employed, and I shall be glad to learn if any one uses such an appliance. Now, the advocates of two furnaces to one oven tell us that while the one is being cleaned the other is at work, and consequently the bad effects referred to—the cold air, and the loss of heat from the furnace—are being cleaned a large quantity of cold air to contend with that they would have with one furnace. Again, I would ask all the advocates of the double furnace to remember that greater heat can be developed from any quantity of coke, properly supplied with air, than in one furnace, than can be obtained from the same quantity of coke consumed in either two or more furnaces, as I have shown by the greatest economy and efficiency in heating retorts has been, and is most likely to be obtained by increasing the furnace so as not only to heat one setting of retorts, but to heat benches of them. If the size of a furnace, with any class of coke, is not capable of heating an oven of any

number of retorts, I maintain that you will heat that oven quite as efficiently, and with less fuel and labour, by enlarging the furnace, than if you were to employ two or more furnaces. With one furnace half the labour of clinkering is saved, and, apart from the money point of view, we save the stoker half the clinkering—by far the most disagreeable duty he has to perform—and that is surely a great saving. There may be some advantage to be derived from two furnaces to one oven; but until I learn something more favourable regarding them I shall continue to think that they are not so economical as the single furnace.

The setting erected at Dumbarton, you will observe from the accompanying diagrams, has four D-shaped retorts, 20 in. by 15 in. by 9 ft. long (inside measurements) to one furnace, which is 12 inches wide at the furnace door, but is increased to 16 inches wide behind. The furnace bars are 3 feet long, and sloped down towards the bottom of the oven, so as to assist the stokers in clinkering, and also to allow of a thicker layer of fuel being deposited thereon. The oven is 6 ft. 6 in. wide, and consequently occupies less than the average retort-house floor; indeed, I am not aware of any setting of four retorts (of a like size) having so small a space. To assist the men in drawing and charging, the retort-house floor is about 4 inches higher than the ground line shown, so that an ordinary sized man's shoulders are above the level of the bottom of the top retorts; therefore the top retorts are as easily worked as the under ones, which are about 30 inches above the ground line shown. I have seen retorts set so low that the workmen had almost to double themselves up in drawing them, or, as they were charged, to stoop over the retorts, and to assist them when standing on the highest point of the retort-house floor. I consider this a great hardship upon our workmen. If we are to have three or four tiers of retorts set above each other, we ought also to have machines, not men, to work them; for whenever men have to do work, they are doing more than their share, and are liable to get tired, and with their backs bent at right angles to their legs, their work is cruel and unnatural. If the designers of retort-settings had to show the men how to work their arrangements for a single day, four, aye and even three tiers of retorts in a setting would be things of the past.

The accompanying diagrams show the heat of the furnace plays first on the bottom of the top retorts and the sides of the under ones; the flame next comes against the bottom of the under retorts, and then passes along the sides of the bottom and top retorts in a thin sheet; and before making its exit at the damper it slowly travels along the crown of the top retorts, giving out heat at its lowest temperature, while it is required to give out the highest heat at its lowest temperature, viz., at the heads, or with their backs bent at right angles to their legs, their work is cruel and unnatural. If the designers of retort-settings had to show the men how to work their arrangements for a single day, four, aye and even three tiers of retorts in a setting would be things of the past.

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I know the importance of this subject demanded something very much better than I have laid before you. However, I trust my remarks are not altogether unworthy of criticism.

(The chemical and other demonstrations in connection with the next paper—that by Mr. Young—having been prepared, and further it being impossible for Mr. Young to be present next day, the discussion on the foregoing paper was commenced and adjourned till Friday, the 9th ult. Under these circumstances, it will be best to hold over the report of the whole discussion till next week's JOURNAL.)

(To be continued.)

STRONG'S WATER GAS SYSTEM.

By Mr. GEORGE S. DWIGHT.

[A communication—dated Stockholm, Feb. 28, 1880—to the Engineering and Mining Journal.]

Some two years since, the representatives of the Strong process publicly announced that it was possible to convert the best anthracite coal to a gas, which, when used for certain limited purposes, was equal in value to the gas derived for practical purposes. The objection was at once raised that there was an absurd attempt to extract from a given weight of carbon more calories than it contains. The charge was based upon the undeniable truth that the burning of C to CO implies the expenditure of a proportion of its heat, and hence the new form must represent less caloric energy than the old.

Prompt answer was made, admitting this last fact, but explaining that the objection was theoretic and not practical—that the comparison must not lie between the potential energy of a fuel and that of its gaseous product, except for certain limited purposes, but that the comparison should be made between the actual energy of the gas and the actual energy of the fuel. It was shown that the theoretic heating powers of fuels are determined by delicate laboratory methods, which, however precise and valuable, are utterly unattainable by ordinary practice; that the steel-makers of Sheffield utilize only 3 per cent. of the value so ascertained; that the domestic iron and steel-makers utilize but about 10 per cent.; while the most economical use of fuel ever attained—namely, in the largest and most perfect blast furnaces, does not exceed 36 per cent. The better result claimed for some boilers was excluded from the comparison, on the apparently just ground that, as the generation of steam is specifically for the domestic use of the boiler, the utilization of the steam should be judged by the power developed rather than the weight of water evaporated, and that, so judged, the loss is as great as in other fuel applications.

Evidence was then offered that in the combustion of the Strong gas it is possible to utilize within 10 to 12 per cent. of its full theoretic value, and

it remained only to make a comparison of results, which was done substantially in the following manner:—One pound of anthracite possesses a potential energy of 13,500 units, of which the actual energy—namely, that realized in practical operations—is, as we have already seen, from 8 to 36 per cent. thereof, or 405 to 4900 units of heat, according to the manner of its use. The gaseous product of 1 lb. of anthracite by the Strong system at that time was 22.33 cubic feet \times weight 0.04116 = 0.919 lbs., possessing a potential energy of 0.919 \times 5798 = 5302 units of heat, and an actual energy of from 88 to 90 per cent. thereof, or 7121 to 7290 units.

Assuming for simplicity what is, perhaps, not an unfair assumption, that the labour cost of conversion is compensated by collateral advantages, such as the reduced labour of using gas fuels, the consumer was left to decide the simple question, from which form of fuel he would realize the greater number of heat units.

This answer on the parts of the advocates of the new system seemed intelligent and correct; at all events, it has never been controverted. Admitting it to be so, we must acknowledge also that the new method of converting carbon into superheated steam, instead of atmospheric air, represents an important advance in the art of combustion.

More recently, additional facts of great interest have been developed by further experience with the Strong furnace more perfectly constructed. The opinion that a great variety of fuels could be used by it has been justified by the results, and the gratifying fact established that all yield nearly identical gases, the variation being not in quality but in volume, which is consistently in proportion to the amount of carbon contained in the fuel. The special excellence of this system in rendering available certain cheap and abundant forms of fuel, heretofore deemed inferior and so neglected, as small coals, culm, and peat dusts, and which were employed in the proportion of 3 lbs. to 1 lb. of the better grade, is now ascertained to have a more important significance than the utilization of cheap material, important as that is.

The facts now to be stated will certainly revive the original objection, that claimed to get more out of the fuel than it contains. Let the proposition be stated in the clearest possible manner. In the earlier operations the advantage was claimed to be a practical one, shown, as already explained, by a comparison between the energies actually derived, it being admitted that the potential energies of the fuel and the gas justified in 13,500; that is, that the loss by conversion was 5405 units of heat, equivalent to about 40 per cent. of the theoretical calorific value of the fuel.

Now, it is claimed that this percentage of loss has, by greater skill and experience in applying the principle, been steadily reduced, till, in some instances, it almost disappears. In other words, the potential energies of the crude fuels and their gaseous products, as heretofore determined by scientists, are approaching so closely as to indicate that the Strong system will yet develop what is now understood to be the maximum theoretical energy of the fuel in its gas. Here are the facts:—

1. If 1 lb. of English coke be treated as before, but the superheated steam is intercepted before coming in contact with the incandescent coke by a shower of pulverized fuel, it is possible to convert a larger weight in gas, and the yield in gas, proportionally to the purity of the dust fuel (that is, the percentage of carbon), will be greatly increased. Take peat powder of the following composition:—

Water	17.90
Combustible gas	20.12
Non-combustible gas	20.05
Carbon	20.05
Ash	15.00

99.94

When 3 lbs. of this material are used, the total gas produced is 101.96 cubic feet. Deducting from this volume the 57.79 cubic feet, which, as already shown, are obtainable from the coke, leaves 76.71 cubic feet as derived from the gas, or 25.39 cubic feet of gas for each pound of peat used.

The total gas product possesses the following potential energy:—101.96 \times 0.04116 = 4196 \times 5798 = 36,916 units. The potential energy of the fuel from which it was derived is:—

3 lbs. peat \times 7854 =	23,562
1 lb. coke	13,500
	37,112

Showing a loss of potential energy of 196 units of heat only. This is equivalent to a loss of about 49 units of heat for each pound of fuel, as against 4224 where the coke was used alone without dust carbon.

If the calorific value of the peat is compared directly and separately with that of its gas, we meet a surprising result, namely:—

76.71 cubic feet \times 0.04116 =	3.136 \times 5798 = 18,175.
3 lbs. peat \times 7854 =	23,562

Here the gas stands related to the fuel as 17 to 1, equivalent to a gain of 4019 units of heat, or 17 per cent. even upon the basis of potential energy. What becomes of the law of loss in conversion? It is not disturbed, but, most strikingly illustrated. The seemingly impossible result is not beyond an explanation, and one which appears to vindicate a theory advanced by the advocates of the new system, and yet to be generally admitted—namely, that in the conversion of carbon from the solid to the gaseous state there is a proportion of the energy of the fuel expended in its own gasification, which, by the action of the steam, and which has never entered into the laboratory tables concerning calorific values. In other words, that the ultimate maximum potential energy of carbon is greater than the accepted estimate.

Let us, for example, the conversion of the peat just explained. The heat essential to the act was furnished by the coke, exerted through the medium of the steam, and hence the carbon of the peat went directly and without reduction into union with the oxygen of the water to form gas, representing 9193 units of heat per pound. When the analyst sought to determine the calorific energy of the peat, he obtained 7854 units only. The difference of 1339 units, or a considerable amount, we must infer was expended in the gasification of the crude fuel, which, according to this theory, is not merely a part of combustion, but a pre-requisite to it. This theory is based upon the proposition that only the gases contained in fuel materials are combustible, and that whatever heat was, during the processes of nature, expended in their solidification from their

original gaseous form, must be repaid to restore it and render them available for combustion.

Let us for the moment regard heat units as a merchantable article, like any other commodity of purchase and sale, and, comparing the above figures upon this commercial basis, see in what market, or in what shape, we can most advantageously buy.

Assume that lump anthracite coal or coke is selling at 1 dol. per ton of 2240 lbs. and that gas is sold at 1 dol. for the same weight, and that we have 1 dol. to spend for practical heat units—that is, for such as we actually get the value of in combustion. (See accompanying table.) Bear in mind that the figures are not theoretic (except in case 4), but show the calorific values actually obtained in practical combustion. The prices, of course, represent the material cost of manufacturing at wholesale only, but they indicate that the gasmaker has a margin for liberal profit without being unreasonable. Naturally the gas purchaser will always determine for himself, as in any other transaction, whether the price charged is in excess of the advantages gained, into which calculation many collaterals, such as the convenience, comfort, and reduced labour attending the use of gas fuels, must enter. And he will always have the alternative of a return to crude fuels, if the gas manufacturer becomes exorbitant in his demands:—

	Units of Heat.	Cost per Ton in U.S.	Per Cent. of Potential Energy of Fuel Utilized.
1. If we pay 1 dol. for lump coal, applied as in Sheffield steel-making, we obtain	226,500	0.0040	8
2. The same sum as applied in domestic uses gives	756,000	0.00132	10
3. The same in the most perfect blast furnace	2,716,100	0.00036	86
4. One dollar's worth of lump coal, converted by the Siemens generator, will yield gas representing theoretically	2,451,574	0.00040	90
5. One dollar for lump coal or coke, converted to water gas, as explained, and burned with 10 per cent.	4,705,891	0.00021	92
6. The same sum expended for one-fourth the lump coal or coke and three-fourths peat, and converted by Strong's system, as explained, yields after allowing 10 per cent. loss	10,623,630	0.00009	99

The table represents both clearly and accurately the advantages possessed by the Strong principle not only as compared with general methods of employing crude fuels directly, but also shows at a glance how far it stands in advance of all preceding gas methods, including even those that rely upon the conversion of carbon in an atmosphere of steam. This last remark may be emphasized in passing by the statement, that careful analysis has shown that, when this gas is exclusively used in the decomposition of the steam, as described earlier in this paper, little or no further increase of heat units—that is, no greater volume of gas—will be probable. A slight gain may result from a reduction of loss by radiation and a further utilization of the sensible heat of the products of the gas furnace; but beyond these trivial gains the process cannot apparently advance.

Not so, however, when the principle is applied to the conversion of carbon dust. The principle itself is so perfect as to admit of no improvement, and yet an increasing experience in its management may still further improve its efficiency. If abundant, from what has been said, that the conversion of a small additional proportion or weight of dust beyond that already successfully used will enable this system to deliver gas representing the full potential value of the fuels as at present estimated. This is a daring promise to make; but we may be truthful of a method which has hispled and pledged, and which has not yet failed to fulfilment of this latest one. The application of the steam principle has had an almost immeasurable influence upon the industries of civilization. The Strong system of conversion is certainly no less important than that, and may, indeed, be said to be the development of that principle to a yet greater plan of beneficial usefulness.

REDUCTION OF THE PRICE OF GAS AT NORWICH.—A reduction in the price of gas at Norwich, from 3s. 9d. to 3s. 6d. per 1000 cubic feet, and to 3s. 2d. per 1000 to large consumers, has been announced.

THE PRICE OF GAS AT MIDDLESBROUGH.—At the monthly meeting of the Middlesbrough Town Council on Tuesday last—the Mayor (Alderman J. Ineson) in the chair—the minutes of the Gas Committee, one of which was “that a reduction be made of 3d. per 1000 feet in the price of gas,” were brought up. Alderman Stevenson, in moving their confirmation, drew special attention to the minute relating to the proposed reduction in the price of gas, which, he said, was passed in his absence; if he had been present he would have endeavoured to have prevented its being passed, because he thought it was not a wise conclusion. The Gas Committee had come to. The Committee were the makers of gas, and the ratepayers and owners of works were the consumers. There were only five or six towns in England where gas was supplied at a less price than at Middlesbrough. There had been no complaint as to the price from any of the consumers, and he was very serious in character. It was also liable to be affected considerably by an advance in the price of coals. The profit on the production of gas amounted to £34d. per 1000 feet, and if half of that profit were taken off it would leave £160d. to stand against the reduction of the price and any increased cost of coal. Looking at the matter from a consumer's point of view, he argued that if the Committee proposed reduction should be made. As makers of the gas, the Committee paid their interest and redemption, and any profits they made they handed over for the benefit of the rates. The making of gas was a profitable, but it was a precarious business, and was liable to calls for repairing damages caused by accidents. The Committee were not to be blamed for the price of gas, £1800 would go into the pockets of the consumers during the next year; but this £1800 would have to come out of the pockets of the general bulk of the ratepayers, including the gas consumers. Alderman Hudson moved as an amendment that the minute be struck out. By 37 votes to 7. The minutes, with this exception, were then confirmed.

In this last computation, the coal is credited with three times the value of gas—namely, 156.25 tons, stated by Percy in “*McCallum's*” (p. 38), &c. As recent investigations prove this gas can only be burned with great loss, if used without the regenerative system, and to be entirely inefficient for general distribution, only its theoretic value is given in this table.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The Forfar Gas Commissioners have just issued their annual statement of accounts, together with the estimates of the ordinary revenue and expenditure for the year ending June 15, 1881. During the past year there was an expenditure of £2220 10s. 2d., together with a fuel revenue of £1515 10s. 4d. The sinking fund now stands at £1424 10s. 6d., and the contingent fund at £1708 16s. During last year the total quantity of gas manufactured was 20,306,000 cubic feet, and the portion unaccounted for amounted to 2,053,400 feet, being equal to a leakage of 10 per cent. on the total manufacture, which is an increase of 2½ per cent. over the leakage of the previous year. This excess seems to have been caused by the new drainage and water supply operations going on in the town. Last year's income from gas consumed was £4297 4s. 1d., from meters £249 12s. 4d., and from residual products £149 11s. 6d.; and together with a sum of £766 14s. 8d. net balance from revenue for the year ending June 15, 1879, making a total annual revenue of £5492 12s. 6d. On account of the increased leakage during the past year, the capizing of the largest gasholder with a loss of 47,000 cubic feet of gas, and repair of the holder at a cost of £145, all charged in the year's accounts, and the increase of the borrowing powers requiring the sum of £170 additional to be provided in the ensuing year's estimate, the balance of the sinking fund, it has been found necessary to advance the price of gas 6d. per 1000 feet for the year ending June 15, 1881. So far as I am aware at the moment, this is the only instance of an increase in the price of gas in Scotland this year.

At their last ordinary meeting, the Dundee Gas Commissioners approved of a recommendation from the Finance Committee to borrow an additional £10,000 under the powers contained in the Dundee Gas Act of 1877; and it was announced that the amount collected for gas-rental during May, June, and July was £1461, being 48s. 7d. less than was collected in the corresponding three months of last year. At the annual general meeting of the Tullis Gas and Water Company was held on Tuesday, the 3rd inst.—Baillie Duffus in the chair. In the report submitted by the Directors it was recommended that a dividend of 5 per cent. to the Shareholders for the year ending June 30 be paid, and that the price of gas for the ensuing year remain as at present—namely, 7s. 6d. per 1000 cubic feet. It was decided that the undivided profits of the Company, numbering 268, be offered to the existing Shareholders at 16s. per share, those not taken up to be offered to the public at the original price, £1 per share. The report was agreed to unanimously.

An ordinary meeting of the Inverness Police Commissioners was held on Monday, the 2nd inst.—Baillie Duffus in the chair—with the conclusion the minutes of the Gas and Water Committee regarding a proposal to reduce the price of gas were under consideration. Mr. A. Mackenzie asked a question as to how much of the available surplus the proposed reduction of 10d. per 1000 cubic feet would absorb. He understood that there was a proposal to reduce the price of gas to 7s. 6d. per 1000 cubic feet, to which he objected, on the ground that the present generation, and not future generations, should have the benefit of the immediate profits. Mr. Hay replied that there was a sum of £1500 available for whatever purpose the Commissioners liked. Mr. W. Maclean was in favour of reducing the price to 7s. 6d. per 1000 cubic feet. It was decided that there would still be a surplus of £500. After some discussion it was agreed to remit the matter to the Gas and Water Committee to consider and report upon. While speaking of Inverness gas affairs, it is proper to make a correction in last week's "Notes." The quantity of gas sold in that town during the last financial year should have been stated at 20,296,000 cubic feet. The leakage is still very high—namely, 19 per cent.; but if last week's figures had been correct the leakage would have been 25 per cent. But though it is still up at 19 per cent., it was about 11 per cent. higher some years ago, when the present Manager entered upon his duties.

The following are some of the figures connected with the lighting department under the Glasgow Police Authorities during the year ending May 15, 1880:—For gas to public and private lamps was expended the sum of £19,987 1s.; then with salaries, wages, clothing to lamp-lighters, and various other items, the total expenditure was £26,436 7s. 5d.; and the receipts, including the sum advanced by the City of Glasgow, sundries sold, and for private lamps, &c., amounted to £3676 11s. 1d. In connection with the lighting of common stairs there was incurred a total expenditure of £23,546 5s. 6d., including wages of stair lighters, cost of gas, and oil.

The Parking the example of the Glasgow Corporation Gas Commissioners, the Patrick, Hillhead, and Maryhill Gas Company have reduced the price of their gas 2d. per 1000 cubic feet, or from 3s. 10d. to 3s. 8d.

The final decision of the Paisley Gas Trust on the price of gas for the ensuing year was arrived at on Monday, the 9th inst. Mr. Johnston withdrew his motion to reduce the price of gas to 3s. 9d. to 3s. 6½d. per 1000 feet, but after consideration of the amount of extra piping required, and the extension necessary at the works, he could not see his way to do so, and he then moved that the price be 3s. 9d. to 3s. 6½d. per 1000 feet. Mr. McGown seconded the motion, which was agreed to. On the motion of Baillie McGown, it was afterwards resolved to give the surplus profits of the gas supply undertaking for last year to the Road Trust for the maintenance and repair of the streets during the coming year—the sum being £1500. It was also agreed, on the motion of the same gentleman, that the members of the Works Committee, to form a contingent fund of £2000, and to contribute £500 per annum to it, until that maximum was reached.

The first annual general meeting of the Insh New Gaslight Company was held last Tuesday. In the absence of the Chairman—Mr. Bisset, of Insh—Dr. Mackie presided. The report submitted by the Secretary, which showed that the Company was a flourishing concern, was unanimously adopted. On the motion of Provost Martin, all the retiring Directors were re-appointed.

Last week's Glasgow pig iron market was very irregular, but a fair business was done. The price of the best close on Friday afternoon was 54s. 3d. cash, and 54s. 6d. on month for buyers, and 54s. 6d. a ton more for sellers. In consequence of the strike of the miners a larger number of blast furnaces are being damped down.

The coal trade is in a most unsatisfactory condition. A number of the sale masters have given an advance of wages, and in many cases there has been a considerable rise in the price of coals.

SOCIETY OF ENGINEERS.—We have been favoured with a copy of the "Transactions" of the Society for 1879, which forms a handsome volume of 221 pages, together with a dozen lithograph plates to illustrate the papers read during the year. In addition to the original Address of the President (Mr. R. P. Spicer), there were seven papers read and discussed at the meetings, those which specially interest our readers—that by Mr. C. J. Alford, on "The Mineralogy of the Island of Sardinia," for which a premium of books was awarded, and that by Mr. H. Robinson on "Sewage Disposal"—having been noticed in the pages of the JOURNAL at the time they were read.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

So far as the coal trade generally of this district is concerned, there has been, if anything, less doing during the past week, the local "wakes" in some of the important centres of industry having interfered with the requirements of a number of classes of coal, and engine fuel has been more plentiful in the market, with a somewhat easier tone in prices.

The half-yearly report of the Wigan Coal and Iron Company, one of the largest concerns in Lancashire, which was published on Saturday, fairly represents the condition of the trade throughout the district, and fully bears out my comments upon the course of business during the past few months. The Directors state that the coal trade has been even more depressed than in the previous half year, that it has been impossible to keep the pits working at anything like their full capacity, and that it has been difficult to stop some of them entirely for the present. The sales have been less than in the previous half year, and the price of coal has been lower than during the previous six months. With regard even to iron, the Directors add that the result of the balance-sheet cannot be called satisfactory, whilst with regard to coal it is very disheartening.

Most of the principal gas coal contracts in this district have now been settled, and generally on low prices, and pretty much upon the figures I gave in my last report, whilst deliveries in most cases extend over from three to five years. The average prices at the pit mouth are about 4s. 3d. to 5s. per ton for common screened gas coal, and 6s. to 6s. 6d. for the better qualities. Cannel varies very much, according to quality, but good Wigan mottled is sold at at least 10s. per ton.

In other descriptions of fuel prices are practically in abeyance as far as the large firms are concerned, the rates being now so low that further reductions are scarcely possible. There is, however, still a good deal of pushing, and many colliery proprietors are so much in want of orders that slight concessions are not allowed to stand the way of anything like a good offer. The better qualities of house-iron coal in anything like quantities average about 7s. to 7s. 6d. per ton; second qualities, 5s. 6d. to 6s. 3d.; and common round coal, 4s. 6d. to 6s. Good ordinary slack is now being offered at about 2s. 9d. to 3s. per ton, and bulky at under 4s. at the pit.

There is a very full demand at about 9s. to 12s. per ton for good qualities at the ovens.

In the iron trade sellers continue very firm, although the business doing is only small. Lancashire makers are securing small orders at about 60s. per ton, less 2½, for foundry delivered into the Manchester district; forge quality, which is a very little quiver for the present, at about 49s. per ton. Finished iron meets with more inquiry, and most of the forges are tolerably busy. Lancashire bars delivered into the Manchester district are quoted at from 45s. 2s. 6d. to 45s. 5s. per ton.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

During the last week or two there has been a better demand for manufacturing fuel of all kinds than has existed in this district for a considerable time past, and there is a pretty general feeling existing that if the present steadiness in the iron trade can be maintained, the outlook for every class of coal will considerably improve. A fair average trade is being done in best household qualities, but at the second-rate pits things are in much the same position they have been throughout the first part of the quarter. At the markets held during the week, both coke and ironstone were 1s. per ton over the prices of the previous week. Furnace coal is now being sold at 9s. per ton, though some classes are to be had at 8s. 6d.; rough slack ranges from 3s. 6d. to 4s. 6d., and forge coal is steady at 5s. 6d.

Following the action taken in the Tipton district, a prominent local agent, acting for the Earl of Dudley and several of the leading colliery owners, now promoting a memorial to the exemption of the Wolverhampton district from the clauses of the Mines Drainage Act. The proceedings now being taken with regard to the Tipton district, and which have been referred to in previous reports, continue to be a subject of frequent comment throughout South Staffordshire. At a meeting of the Mines Drainage Commissioners held on Friday, the 13th inst., the representatives of the district, who were anxious to delay pumping expenses, and if the Tipton district was voted out of the operation of the Act, it would speedily become flooded, and like the Bilston district, wherein there were enormous quantities of minerals still to be had, would be unworkable. It is thought that if the Tipton district becomes flooded, the world would be thrown into the sea, and there would be a great underground sea reaching from Wolverhampton to West Bromwich. The chairman of the meeting above referred to made a statement to the effect that if the memorial of the Tipton district was successful, the whole of the South Staffordshire district would speedily be ruined, and would therefore cease to be a great iron-making centre.

The iron trade continues steady, and there is a growing demand from America, India, the Cape, and China. The tariffs of the United States, however, continue to be a great stop to the development of the export trade. During the past week several extensive orders have reached the district, and there is, on the whole, cause for congratulation. At Walsall a new furnace has just been lighted by the Castle Iron Company, and most of those now in working order are actively employed. The iron markets are firm, and a healthful business tone prevails. Marked bars are firm, and common single sheets are quoted at 48s. In the pig trade the markets are looking very quiet, and the price of the best is about 45s. of a week ago. At these rates, too, there is a good call. Hoops, nail-roads, galvanized sheets, and other classes of finished iron are in steady request.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The house coal trade in most parts of Yorkshire is still in a very quiet and unsatisfactory state. Many of the collieries are being worked devoid of profit, notwithstanding all efforts to reduce expenses. Throughout West Yorkshire, as in the southern part of the coal-field, the pitmasters are making very little sale of their better qualities of coal. The business in the Wombwell, Wath, and Rotherham districts continue to be fairly worked, having, as a rule, a very fine quality of the nine-feet Barnsley bed to dispose of. Although the pits do not work so well as could be wished, the tonnage sent by rail over the Great Northern line is nearly as large as it was a few years ago. The depressed position of the business doing in house coal is in a great measure due to the high tonnage rates, and the vast output which is taking place at the collieries where the capacity for drawing from 1000 to 1200 tons per day has to be contended with. Some of the Silkestone pits which have been worked for years are almost finished, and the collieries which have been opened in the last few years in the market at low rates, for the purpose of securing a connection. The local trade is only quiet, as is also the demand for house coal for Lincolnshire. Advice from the Eastern Counties are of a desponding nature, the trade being scarcely ever worse or more unprofitable.

There is a pretty business going on for coal for Hull, where the exports hold well up. Great rejoicings have taken place, owing to the

passing of the projected Hull and Barnsley Railway; but it must be admitted that Barnsley and the district will be but little benefited by the new line, unless its powers be extended, or some arrangement made to connect Barnsley and other important parts of the coal-field. Last week the exports at Grimsby showed a marked falling off, and consequently several of the leading South Yorkshire collieries did a much quieter trade. There is a fair quantity of hard coal forwarded to Goole and Barrow by some of the pits in both parts of the coal-field.

On the whole, those pits which were so fortunate enough to secure contracts for gas coal are now forwarding a fair tonnage to various parts of the country, but the quiet state of the general trade has, of course, diminished the consumption of gas and the consequent demand; for coal merchants in business in the Eastern Counties, who usually take a good deal of gas coal, are ordering very little, and that only of best qualities.

Locomotive coal, for the use of the various Railway Companies, and manufacturing fuel are in fair request, and prices of the latter are much more steady than might be expected. This arises from the great consumption for coke-making purposes, and the small output where the pits are only working two and three days a week. The coke trade, however, seems quieter, and prices grow more feeble. All things considered, there is a very large output, and some of the works have orders on hand which will consume all they can produce for several months to come.

The iron trade exhibits but little alteration since my last notice. A few of the works, including those at Thorncliffe, where a good deal of gas apparatus is made, are pretty busy; but the general foundries are not over well off for orders, and many classes of workmen are employed short time. The blast furnaces are kept pretty regularly at work, and produce about an average tonnage of pig iron. Those works devoted to the output of Bessemer steel rails, tires, &c., are pretty busy with home and foreign orders.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The August shipments of coal, at an ordinary average, but no more steamers were chartered last week to take gas coals to the Russian ports of the Baltic, and some sailing ships were engaged to load coals for the Irish gas-works. Gas coals have likewise been sent to Italy and other parts of the Mediterranean. The improvement which has been experienced in the iron trade is in part due to the fact that orders for gas coals. Owners of second-class collieries in the county of Durham have as much difficulty in getting orders for coals of this description as they did in the worst days of depression in the trade, while the trouble of carrying on at a profit is still greater. Railway coals have a dull trade, likewise, and the output of the best steam coals. The coke trade is steady, and prices continue to improve gradually.

The coasting freight market is very dull. There is an excess of sailing vessels of from 15 to 20 keels in the market. The freights offered to them to load coals are extremely low, and will barely pay for sailing the vessels to the coast. The general trades of the county of Durham have been quiet to a considerable extent. The prices of coal and other articles of the kind to Newcastle are no more than 5s. 10d. per ton, and all other Baltic ports in proportion. This shows a very poor business.

The Cleveland iron market was hardly so strong last week as in the week previously. At the same time prices have not fallen more than about 1s. 6d. per ton. Ironfounders say that orders are difficult to secure, and higher prices than those which prevailed in June cannot be maintained. The cost of manufacturing is increasing, whilst the value of the produce remains unchanged. The shipments of fire-bricks and fire-clay goods, cement, &c., were pretty large last week. The demand from abroad has been but very small.

The labour market has been a little disturbed in the Tyne lately, and the mischief threatens to extend to other rivers. In the general manufacturing trade, however, labour is very abundant. All recent attempts to force wages up in the chemical and some other trades have failed.

The price of the British market has been a little higher last week. There was an improvement of 2 or 3 per cent in prices.

The lead market keeps steady. There were arrivals of lead from Spain and Germany in the Tyne last week. The timber business, while it has recovered from the effects of over-speculation in the spring, shows no improvement in prices in the last sales.

ILKESTON LOCAL BOARD WATER SUPPLY.—At the last monthly meeting of the above-named Board, the Clerk reported that the whole of the loan obtained for the purchase of the Ilkeston Water-Works and the construction of auxiliary water-works, amounting to £16,000, had been expended. The filter-beds in course of construction, and the repayment of the amount expended out of the rates, &c., would probably require about £1500. It was agreed that application should be made to the Local Government Board for sanction to raise a further loan of £2000.

The Globe, last Wednesday, in one of their "Notes of the Day," headed "A Fortunate Town," says: "The mouth of the Metropolitan ratepayer may well water when he reads of the good fortune that sometimes befalls his class in other English cities through the judicious investment of municipal officers. It was the case for instance at Swanssea, where, owing to the application to that purpose of the profits accruing from the municipal supply of gas and water. This is managed so deftly, too, that the charges to consumers are generally much less than in towns like London, where private Companies do the work." They then go on to instance the case of the water supply of the Corporation of Swanssea, and possibly have chosen—Swanssea; where, though great opposition has at times been raised against the local Gas Company, no action has been taken to acquire the undertaking, simply because the ratepayers have not the slightest confidence in the ability of the Corporation to manage the concerns they already have in hand. The Corporation have been giving anything but satisfaction, though vast sums (almost to the ruin of the town) have been expended in the endeavour to make them adequate to the requirements of the place. This, however, by the way. The article concludes: "How much more pleasantly circumstanced would the London ratpayer be if all the profits that are derived from the gas, water, and gas and water supplies [why stop here? Why not include all other trading concerns, such as butchers, bakers, tailors, &c.?] found their way into the municipal coffers, and were applied in reduction of the rates. Impossible as such a change of mind seems at present, perhaps an honest generalizer might be tempted to suggest that the rejection of the late scheme for buying up the Water Companies was eminently shortsighted and foolish. It may then appear that, huge as was the sum agreed to by Mr. Smith, it would have eventually afforded an ample margin for profit, owing to the enhanced value of houses and the cessation of the year expenditure. This is the kind of criticism that might be made in the London daily press, founded on a merely superficial consideration of the question under discussion. As long as the provisional agreements made for the purchase of the London Water Companies works were in existence they were cried down; now the dissatisfied press begins to think it might have been well had they been accepted. Thus are the public led and misled."

SALE OF NOTTINGHAM CORPORATION GAS AND WATER STOCK.—On Thursday last some of the Nottingham Corporation Gas Annuities were disposed of by public auction, at 47½ 15s., 47½ 10s., and 47½ 5s. 6d.; a £50 water share realized £30 15s. and a £25 ditto £20 5s. 6d.

STOCKTON AND MIDDLESBROUGH CORPORATION WATER SUPPLY.—At the monthly meeting of the Stockton and Middlesbrough Water Board on Monday, the 9th inst., the Finance Committee reported that the net revenue for the past year would allow of £14,000 being paid over to each of the Corporations.

FAYERSHAM GAS COMPANY.—The annual general meeting of this Company was held on the 11th inst.—Mr. Bigden in the chair—when a dividend of 10 per cent. was declared. The price of gas to private consumers was reduced from 4s. to 3s. 8d. for 100 feet, still further reducible to 3s. 6d. for prompt payment; and the charge for the public lamps was lowered from 4d. 6s. to 4½ pence per lamp.

SALE OF SHARES IN THE BRIGHTON AND HOVE GAS COMPANY.—On Wednesday last Messrs. Edwin Fox and Bousfield offered for sale at the Auction Mart, Tokenhouse Yard, twenty-five £20 "A" shares, fully paid up, in the above Company. The shares were put up in five lots, for the first of which £20 15s. was paid, and at the rate of £33 17s. 6d. per share; lots 2 and 3 were sold for £315, or at the rate of £21 10s. per share; the last lot fetching £160, or at the rate of £32 per share. The total amount realized by the sale was £813 15s., being a premium of £313 15s. upon the nominal value of the shares.

IMPROVEMENT IN THE BUNSEN PHOTOMETER.—Engineering says: "In using the ordinary Bunsen photometer, the disappearance of the oil spot on a sheet of thin paper depends on the position of the eye of the observer. With a modification of the instrument, the spot disappears at all distances, and is less sensitive. A better plan is that introduced by Herr Topler, who replaces the ordinary single sheet of paper by two thin sheets of parchment paper placed on each side of a sheet of stout paper perforated by a hole about an inch in diameter. The sheets are stretched on a frame, and placed between two planes of clear coloured glass, so that the light which traverses the whole area of the illuminated spot is equally bright, and the spot disappears entirely when the lights are properly opposed. The adjustment is easy, the observation can be made with both eyes, and the result is independent of the position of the eyes."

BRAMPTON GAS COMPANY.—The annual report of this Company exhibits a satisfactory condition of affairs, the past year having been one of increased prosperity, while the Directors confidently anticipate a continued improvement. The net profit for the twelve months ended June 30 was £183 11s. 10d., on receipts amounting to £380. This added to the amount of last year's balance, £150 4s. 10d., indicates a disposable balance of £333 16s. 8d., out of which the Directors propose a dividend, free of income tax, of 6 per cent., amounting to £180, leaving a balance of £153 6s. 8d. to be carried forward to the credit of the next year's account. The Directors state that the works are in good repair, and will only require the usual amount expended to keep them so. Since Mr. Samuel Rutter took charge of the works the prospects of the Company have much improved; 6 per cent. is to be paid this year, in place of 5 per cent. only last year.

THE SALFORD GAS COMMITTEE AND THE PRICE OF GAS IN THE OUT-DISTRICTS.—It may be remembered that at their meeting on the 7th ult. the Salford Town Council adopted a recommendation of the General Gas Committee reducing the price of gas from 3s. 10d. to 3s. 9d. per 1000 feet to all consumers outside the borough within five miles of the Regent Road works. On that occasion one of the members of the Council expressed his dissent from this resolution, and stated that he would vote against it; but it appears that the Barton and Swinton Local Boards, who are supplied with gas by the Salford Corporation, are not of his opinion, and deputations from those two bodies recently waited by appointment upon the Salford Gas Committee, and urged their claims to a further reduction of the price of gas. The Committee considered the matter, and the price of gas supplied to the out-districts by an additional 3d. per 1000 feet, thus making the reduction 3d. per 1000 feet to consumers of every kind. This further reduction was communicated to the Swinton Local Board at their meeting on Tuesday last, but the concession did not meet with their approval; and the Salford Gas Committee, on the 11th inst., the Board had succeeded in getting the price of gas reduced to private consumers, the charge for that supplied to the public lamps was still the same. There were 411 lamps in the district, for which the Board paid about £500 per annum. He moved, and it was agreed—"That the Clerk be left to write to the Salford Gas Committee, requesting that they will reduce the price of the gas supplied to the public lamps at least 1s. 6d. per lamp per 1000 hours."

LIVERPOOL CORPORATION (VYRWY) WATER SCHEME.—At a special meeting of the Liverpool City Council, held on Monday, the 9th inst.,—the Mayor (Alderman B. Hall) in the chair—a report was presented by the Parliamentary Sub-Water Committee, recommending the carrying out of the first section of the new water scheme sanctioned by the Liverpool Corporation. The report was passed by the Council, and the General Committee, in moving the adoption of the report, remarked that this was almost the only instance of a measure affecting such important interests, and involving an ultimate expenditure of upwards of three millions of money, having been passed, not only without opposition, but with the acquiescence of all classes of the community. It would be secured by a minimum quantity of 40 gallons of water daily per head. It also enabled the Corporation to sell water to their neighbours at a fair price. What, however, was of great importance was that the Corporation had power ultimately to retain the whole water supply, the condition being that five years notice be given when notice was given when only 30 gallons per head are available for increased population. The only payments to which the Corporation were committed were £30,500 to the various interests on the Severn; and to other petitioners, for legal expenses, some £1400. The Engineers had confidence that the estimates submitted to the Council would be found to be correct, and that the cost of the scheme would be to the extent of £25,000, owing to the additional height of the embankment at the Vyrwy necessary to meet the increased compensation water to be given to the Severn. No amount had been included in the Engineers estimate for the purchase of the watershed, but about £300 acre had been acquired for £51,000, and if the remainder of the shed round the Vyrwy lake could be bought, it would ensure the absolute purity of the water for all time. Manchester had wisely acquired the watershed at Thirlmere, and it was to be hoped the same thing would be done by Liverpool at the Vyrwy. The estimates, however, would be increased by any such changes, and the amount of interest they would pay could not be large. The report was adopted, and the thanks of the Council were voted to Mr. Wilson, Chairman of the Water Committee, and Mr. Bower, Chairman of the Parliamentary Sub-Water Committee, for the skill and energy they had displayed in promoting the new water project, and in carrying out the parliamentary proceedings in connection therewith.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 3140.—LAKE, H. H., Southampton Buildings, London, "Improvements in gas-engines." A communication. July 30, 1880.
- 3182.—TURNER, F. W., St. Albans, Herts, "Improvements in gas motor engines." Aug. 3, 1880.
- 3190.—WESTINGHOUSE, G., jun., Southampton Buildings, London, "Improvements in apparatus for carburetting air so as to render it combustible as gas for lighting and heating purposes." Aug. 4, 1880.
- 3203.—FLETCHER, T., Warrington, Lancs, "Improvements in gas-burners for heating purposes." Aug. 5, 1880.
- 3225.—GROTH, L. A., Finsbury Pavement, London, "An improved construction of meter for water and other fluids." A communication. Aug. 6, 1880.
- 3248.—SPECHT, A., Hamburg, Germany, "Improvements in apparatus for carburetting coal gas." A communication. Aug. 9, 1880.
- 3261.—MELLING, T., Aigburth, Lancs, "Improvements in water meters or motors, or apparatus for measuring and registering the quantity of water or other fluid flowing through pipes or other conduits, which improvements are also applicable to other hydraulic purposes." Aug. 10, 1880.
- 3267.—WHITLEY, J., and PICKLES, R., Bradford, Yorks, "Improvements in gas purifiers or scrubbers." Aug. 10, 1880.
- 3283.—IRELAND, J., Plymouth, Devon, "Improvements in methods or means for enriching or purifying illuminating gas, and in apparatus therefor." Aug. 12, 1880.
- 3293.—GRACE, G. P., Peckham, Surrey, "Improvements in pressure-governors or reducing valves for regulating the pressure of liquids, gas, and air." Aug. 12, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 533.—THOMPSON, W. P., High Holborn, London, "Improvements in and appertaining to gas-engines, or engines actuated by the explosion or combustion of mixed gas or vapour and air." A communication. Feb. 7, 1880.
- 655.—HALLAM, S., and SCOTT, G. L., Manchester, "Improvements in motive power engines and generators, in which the pressure is derived from the combustion of inflammable gas or vapour." Feb. 16, 1880.

- 712.—MAUGHAN, B. W., Cheapside, London, "An automatic apparatus for regulating the varying pressures, or controlling the supply of gas or other fluid." Feb. 15, 1880.
- 735.—WILKINSON, W. B., Kingston-upon-Hull, "Improvements in apparatus used with gas or other lights for holding the globes or other glasses used therewith." Feb. 19, 1880.
- 780.—HOEGER, A., Cologne, "Improvements in apparatus for producing gaseous fuel for combustion in furnaces, ovens, or kilns, and for utilizing the waste heat of the products of such combustion, more particularly applicable for heating the retorts in gas-works." Feb. 23, 1880.
- 791.—CHAMBERLAIN, A. P., Finsbury, London, "Improvements in the manufacture of gas for illuminating and heating and other purposes." Feb. 23, 1880.
- 1800.—GLOVER, T. G., Belfast, Ireland, "Improvements in the manufacture of ammonia and ammoniacal salts." May 8, 1880.
- 2096.—PIEPER, C., Berlin, "Improvements in cocks for gaseous and liquid fluids." A communication. May 24, 1880.
- 2135.—LIVERSY, J., Westminster, "Improvements in apparatus for enriching gas by admixture of hydrocarbon vapour." Partly a communication. May 25, 1880.
- 2271.—WATSON, J. J. W., St. Marychurch, South Devon, "Improvements in or relating to artificial illumination, and in apparatus connected therewith." June 3, 1880.
- 2290.—LIVERSY, J., Westminster, "Improvements in gas motor engines." A communication. June 7, 1880.
- 2311.—ROBINSON, H., Manchester, "Improvements in gas motor engines." June 10, 1880.

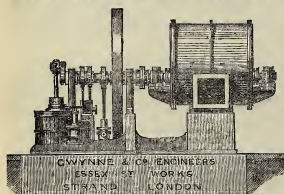
PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY, OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

- 2469.—GURBINS, R. R., and WHITSTONE, J., "Improvements applicable to valves for gas, water, or steam pipes, and in the means of cleaning and grinding the working faces of such valves; part of which improvements are also applicable for protecting parts of other machines or apparatus from injury by oxidation." June 20, 1877.
- 2476.—WALLACE, R. W., and CLAU, C. F., "Improvements in the purification of lime, and the utilization of bye-products by the manufacture of secondary products therefrom." June 27, 1877.

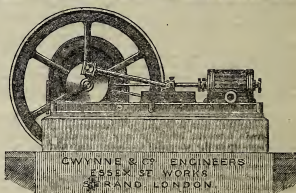
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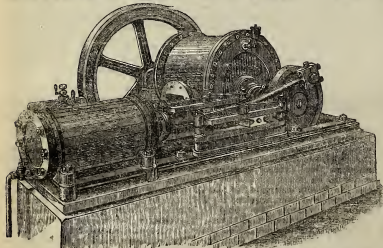
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[SEE ALSO ADVERTISEMENT, PAGE 378.]

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TO CORRESPONDENTS.

G. B.—We shall be glad to have from you the reports you promise.
MANAGER OF SMALL COUNTRY GAS-WORKS.—The law and practice in regard to gas supply by incorporated and non-statutory Gas Companies is, in many respects, so essentially different, that we cannot give you an answer to your question, unless you say whether or not the Company you refer to is working under the protection of an Act of Parliament.
No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 24, 1880.

Circular to Gas Companies.

A RATHER hard experience has befallen the Gas Committee of the Leeds Corporation in relation to the reduction they recently proposed in the price of their gas. The discussion which we reported last week may well have a depressing effect not only upon the Leeds Gas Committee, but also upon such others in neighbouring or distant towns as may desire to emulate their example. Conscious that they had done well with the charge committed to them, and justly proud of the report they were then presenting, it must have been cruelly disappointing to be met with amendments and disparagement rather than the compliments to which they were surely entitled. The occasion was seized to agitate in favour of a number of fads, plausible in themselves, and especially so upon a first acquaintance, but which were in part opposed to the judgment and good sense of the Committee, and in part receiving their earnest attention. It was contended that the price of 2s. 2d. per thousand cubic feet was low enough, and that no one asked that it should be lower; but that it was desirable that sulphur compounds should be eliminated, that meter-rents should be abolished, and the illuminating power of the gas—already eighteen candles by the "London" burner—increased. After a protracted dis-

cussion, these amendments were negatived, and the report of the Committee carried; but the inevitable result has been to deprive the Committee of all present credit for their enterprise, and not improbably to create in the minds of many consumers an unfair doubt as to the value of the advantages secured to them. We observe that these amendments were introduced by a member of the Gas Committee, who must, therefore, have had previous opportunities of advocating his views where they could be properly considered.

There can be no doubt that Leeds can afford to make expensive experiments in refinements of purification, quite as well as, or perhaps better than any other town. There can be little doubt, either, that whether or not any actual difference or improvement were perceptible by the consumers after the sulphur had been reduced—and we are very confident that no such difference would be perceptible—yet it is desirable to make the gas supplied as pure as possible, not only for the sake of the slight sanitary improvement that would result, but also that the perturbed citizens may enjoy upon this matter that "easy mind" which is so desirable. The Gas Committee are evidently of this idea also, for we note that they have passed a resolution—"That the Engineer be instructed forthwith to adopt means of reducing the sulphur "impurities in the gas, so that the same shall not exceed "twenty grains per hundred cubic feet." We shall look with interest for the response by the Engineer to this requirement. The Leeds works are each situate in populous neighbourhoods, and the residents therein will probably have something to say if the much diluted nuisance of the consumers generally is to be met by inflicting upon them the concentrated abomination of the sulphide of lime process. We understand that a series of experiments is being made upon a practical scale, to determine the character of the coals of the district in regard to sulphur, and from these experiments considerable advantages are confidently anticipated. If the Committee can afford to purchase the coals that are most satisfactory in this respect, they may probably be able to keep within the limit without any further alteration of their purifying plant; if not, they must be enlisted in the army of troubled experimenters who have for years been seeking after a solution of this question, and we cordially wish success to their labours. The proposal still further to increase the illuminating power of the gas would, if carried, probably cause an immediate increase in the complaints of impurity. Much of the oppressiveness and discomfort of rooms liberally lighted with gas and ill provided with means of ventilation is due to unburnt carbon given off, and the proportion of this offensive vitiation would increase with the increase of the illuminating value, at least, until there had been a general adaptation of the burners to the gas.

It is curious to observe how altered prices affect the policy of Gas Companies; what is sound policy under a price, say, of 4s. per thousand feet becoming untenable at 2s. A conspicuous example of this is afforded by the question of meter-rents. At 4s. per thousand feet the margin of profit is so considerable that it may, and does, pay to acquire custom on a very small scale; but at the lower price, which, in the case of the smallest consumers, is less than the cost to the Company of delivering the gas, it is palpably impossible to make special concessions to win their patronage. We therefore cannot but commend the conduct of the Leeds Corporation in retaining the reasonable rents for meters which are in operation. We purpose returning to the consideration of this question of meter-rents upon an early day.

If the estimates on which the reduction of price was determined prove incorrect, the Committee must be prepared to accept the responsibility attaching to them. In the meantime, we are glad they have abided by their report. We are disposed to admire their enterprise and public spirit the more, because it affirms that every one was contented with the former price. The benefit to the public will be none the less because given without compulsion, neither will the return to the Committee in increased business be the less on that account; and, further, we may venture to predict that however ungracious the treatment accorded them at the recent meeting of the Town Council, a continuance of their present policy will certainly bring to the Gas Committee in the long run the recognition and approval it deserves.

The report of the Gas Committee of the Corporation of Glasgow on the gas supply of the city for the year ending the 1st of June is eminently satisfactory. The gross revenue for the twelve months amounted to £341,274 13s. 1d., and the expenditure, including £30,271 13s. 1d. written off capital for depreciation, was £257,351 4s. 3d., the balance

carried to profit and loss account being £83,923 8s. 10d. Annuities, interest on borrowed money, and sinking-fund absorbed £70,141 1s. 3d., and the net surplus for the year was £13,782 7s. 7d. To this is to be added the balance brought forward from last year's account, £34,508 6s. 3d., and the total amount to be carried forward to next year is therefore £48,290 13s. 10d. The undertaking having thriven so well, it is pleasing to be able to note that the first result of this prosperity has been a reduction in the price of gas from 3s. 10d. to 3s. 8d. per 1000 cubic feet, and hopes are expressed that further reduction may be possible. Since 1870, when the gas-works came under the control of the Corporation, the progress of the undertaking has been marked with increasing economy in manufacture and distribution, and while the cost of coal is as nearly as possible the same now as then, the gas is sold for sevenpence per thousand feet less to all classes of consumers. From the general tenor of the remarks of the Chairman of the Gas Committee, at the meeting of the Town Council at which these results were reported, we gather that the Corporation are truly desirous of administering this great property in the interests of the consumers, and in so doing they will certainly not fail of their due reward. The manner in which the £48,000, accumulated surplus above mentioned is to be dealt with, is exceptional, like the circumstances. A further allowance of 2½ per cent. is to be written off all plant except meters, and the sum of £5000 is to be paid over to the general funds of the Corporation, virtually as a gift for a special purpose, not to be taken as a precedent for devoting money from the gas profits to the general purposes of the Corporation. The effect of these two operations will be to reduce the surplus about one-half, and on the principle upon which the Committee at present conduct their business, it will perhaps be some years before they will be again required to give away so much money from accumulated profits.

The report of the Gas Committee of the Lancaster Town Council on the first year's working of the gas undertaking since it became public property is now before us, and it must be admitted that the Committee have entered on the business in an admirable spirit. Although there was a slight decrease in the amount of gas consumed during the year, the net profit, after all claims due to capital have been satisfied, amounts to £2335 10s. 6d., out of which the sum of £1200 has been set aside towards defraying the cost of the parliamentary proceedings in connection with the acquisition of the undertaking, and the remainder has been made the foundation of a reserve-fund. The Committee have also taken the bold step of reducing the price of gas to small consumers from 4s. 2d. to 3s. 8d., and to large consumers from 3s. 8d. to 3s. 6d. per thousand cubic feet, dating from the 1st of July last. It is very creditable to the public spirit of the Council that this proposal was unanimously agreed to, and it is to be hoped that the increase of the business during the ensuing year may be such as to justify their action. The principles on which the Gas Committee have determined to act, as enunciated by their Chairman, are to reduce the debt on the works, and at the same time to reduce the price of gas to consumers; and there can be no doubt as to their soundness, but we must counsel caution and the exercise of foresight in applying them, for fear lest discredit should attach to the system because of disappointments following over-confidence on the part of the managers of the property, which, as yet, is not remarkable for elasticity.

The report of the Directors of the Peterborough Gas Company for the half year ending the 30th of June shows that maximum dividends on the ordinary share capital have been earned, after providing for the dividend on the preference shares, the balance to be carried forward being only £87, which is a rather narrow margin. There is nothing requiring special comment in the statement of accounts which accompanies the report, the make of gas per ton of coal—10,680 cubic feet—is good, while the Company get their coal cheap, and realize a good sum from residuals. In other respects they appear to have had a fairly prosperous half year.

The gas supply of Goolle is about to enter on a new phase under rather peculiar circumstances. Up to the present time the gas has been furnished by the Aire and Calder Navigation Company, who own the greater part of the town, but a proposal has recently been made for the transfer of the works to a new Company with a nominal capital of £60,000, of which the Navigation Company are to hold one-third, another third is to be taken up by the Goolle Local Board, and the remainder is to be offered for public subscription. The Com-

pany thus constituted will also seek power to supply water; but the powers in respect to gas recently conferred by Parliament on the Navigation Company will, of course, be handed over with the gas property. There appears every reason to expect that this experiment in the direction of consolidating several interests will meet with complete success; the idea of it is at least highly creditable to the originator of the scheme, which emanated, we believe, from the Navigation Company, whose Engineer, Mr. Bartholomew, is responsible for the details of the arrangement.

When Corporations are meditating the acquisition of gas undertakings, the considerations for and against such transactions are generally stated with great fulness of detail by the friends and opponents of every proposal of the kind. But there is one consequence that in the great majority of cases follows when the gas supply becomes public property, which is never foreseen, even by the individuals who are destined to help in bringing it about. We allude to the divisions and heartburnings which arise among the members of almost every Town Council, or similar organization, when the profits made by the gas undertaking controlled by them have to be disposed of. Then it is that the soundness of men's financial opinions are tried, and professing friends of gas consumers and ratepayers, unnaturally opposed in uncivil war, wrangle over a divisible surplus like dogs over a bone. Examples of discord in municipal bodies thus caused are exceedingly numerous, as our columns prove, for a week seldom passes without our being called upon to notice one or more instances wherein special circumstances exist to give general interest to what would otherwise be too ordinary for comment. The case of the Town Council of Bolton, and their manner of dealing with the report of their Gas Committee, seem to require special attention from this point of view. The profits of the Bolton Corporation gas undertaking during the past year, after the annuities account, interest on loans, and sinking-fund had been provided for, amounted to £23,930 19s. 7d., which is a very handsome sum for the gas consumers of the district to be mulcted of, looking at it as so much absolute profit. The Gas Committee proposed to allot this amount as follows:—About £7000 was to go for depreciation of works and plant; an equal sum was placed to the credit of the reserve account; the district rates were to have the rest—nearly £10,000; and, to compensate the gas consumers, a reduction of fourpence per thousand feet was to inaugurate the coming year. It seems difficult to imagine that opposition to this reduction should be offered, after such a record as the Gas Committee were able to show, yet it was not only offered, but persisted in till the whole question was referred to the General Purposes Committee for consideration. The principal antagonist to the Gas Committee based his objections to their recommendations chiefly on the amount to be allowed for depreciation, which he declared to be excessive; but the object of the opposition was, of course, to get more money in relief of the rates. It was shown that the price of gas in Bolton is high compared with other places in the neighbourhood, and, above all, that the profits of the past year were almost more than the Committee knew what to do with, yet the consumers are not to have any relief, for in Bolton, as in too many other places, they must continue to pay rates that others may go lighter. We sometimes hear "justice's justice" mentioned in uncompensatory terms. Town Councillors justice to gas consumers appears to be often of the same brand.

There is but little good-will at present existing between the Cork Gas Company and the Corporation. It will be remembered that the Company have been in Parliament this session to obtain, among other things, power to increase their capital and to adopt the sliding scale. A great conflict arose before the House of Commons Committee between the Company and the Corporation, about the initial price, which the former intended to fix at 4s. 6d. per thousand feet, being a reduction of threepence from that permitted by their existing Act of Parliament; while the latter sought to obtain a reduction to 3s. 6d. per thousand. In the end it is not surprising to hear that the Committee steered a middle course, and declared that the price should be 4s. This did not please either party, but the promoters of the Bill sought to come to an understanding with their opponents by offering to accept 4s. 3d., which was rejected, and the Company thereupon solved the difficulty heroically, by dropping the Bill. This unexpected proceeding altogether upset the calculations of the Corporation, whose implicit faith in their professional advisers led them to neglect the homely proverb which says that "half a loaf is better than no bread," and the Company

are consequently abused because that they, the Corporation, are left to pay for advice which they followed "not wisely, but too well." In this affair, terminating in such a miserable *fiasco*, the Corporation are, in our opinion, alone to blame. They should have been taught by experience—for they have had, at one time and another, a host of engineers and professional advisers generally—that an adviser is not a dictator; he may be perfectly justified in his counsels by the facts before him, but policy, with which he has no concern, may overrule his recommendations. The Corporation of Cork have now to pay for omitting to see this in the light of the special circumstances of their case. If the passing of the Bill had been a matter of life and death to the Company, they must have submitted to the terms imposed by the House of Commons Committee, in default of better; but, as it happened, they were able to master the situation, and effect a strategic retreat, to await another and perhaps more favourable opportunity. They can scarcely be blamed, as matters stand; but it is to be regretted that a procedure certain to lead to embittered relations between those who ought to be good friends should ever have appeared necessary.

The members of the Manchester District Institution of Gas Engineers and Managers will hold their forty-third quarterly meeting on Saturday next, the 28th inst., at Halifax, assembling at the Corporation Gas-Works, which are under the direction of their President, Mr. Carr. There is no association of this class which shows more vitality or does better service than that which has its head-quarters in Manchester, and draws its members from the busy manufacturing towns which surround that important centre, and the coming gathering bids fair to be as interesting as most of those which have preceded it.

The paper read by Mr. Young at the last meeting of the North British Association of Gas Managers, although unpretentiously styled "Jottings on the Principles involved in 'Gas Manufacture,'" was a highly interesting and instructive communication, containing many suggestions which may lead to valuable practical results. Manufacturers whose energies are devoted to the daily work of their establishments, are indebted in no small degree to those who from time to time compel their attention to the abstract principles on which their operations are based, especially when the actual and possible relations of those principles to the processes which depend on them are treated of with such clearness as marks the paper in question. Mr. Young's observations on the action of radiant heat in the destructive distillation of coal, throws light on the question of the shape of retorts and the difference between heavy and light charring; but the idea of double distillation, which he appears to regard with some favour, does not recommend itself very strongly. We should, however, be glad to see the experiment fairly tried. The principal interest of Mr. Young's communication centres in his description of the apparatus described by him as at once a most efficient washer, purifier, and carburetter, which, whatever may be the verdict eventually passed upon its performance after such extended trial as it seems to deserve, may at least be described as a most ingeniously arranged apparatus. Mr. Young discusses several other matters in connection with gas manufacture in his somewhat lengthy paper, such as the compensation of meters for variations of temperature and pressure, and also makes a valuable contribution to the theory of condensation, which is a department well worth his attention, and in which his assistance will be welcomed by gas engineers whose minds are at present somewhat occupied with this matter.

The electric lighting of some portions of the South Kensington Museum during the past year, where an experiment has been made with it in two rooms and in the Art Library, does not appear to have been very successful. Wilde's machine and lights were tried in the Raphaël Gallery and in one of the Sheepshanks Rooms; but the noise emitted by the lamps was very objectionable, and they had to be discontinued on that account. The Werdemann lamp was the one selected for trial in the Library, worked by a Gramme and afterwards by a Siemens machine, the motive power in each case being a gas-engine; but the results were not satisfactory to Mr. Werdemann, and he therefore suspended the trials until he could get a better arrangement for producing the current. The Werdemann light gave every satisfaction as regards steadiness and colour, but the expense of working, including carbons, was about three times as much as the cost of the gas lighting previously employed. It is said, however—but with what reason we know not—that in the new reading-room the cost of gas will be much greater, while

that of the electric light will remain proportionately the same as in the Art Library. The experiments will be resumed as occasions offer, and other systems of lighting will be tested in order to determine which will answer best for other parts of the Museum. The results thus briefly indicated have attracted the attention of the Liverpool press, which has been clamouring for an extended use of the electric light in that town, and as they do not altogether go in favour of the light, they are assailed with scornful epithets, and the experiments themselves are declared to be unworthy the name. It is difficult to understand how exception can be taken to the trials, however unpleasant their lessons may be to some people, for the respective inventors and manufacturers of the apparatus employed appear to have had a fair field, even if there was no particular favour shown them. That the trials were not more successful was certainly not the fault of Major Festing, R.E., the Assistant Director, who has special charge of the buildings, and the whole arrangements for lighting, heating, ventilation, &c. He has repeatedly expressed his appreciation of some qualities of the electric light, and it has probably been a disappointment to him to record its practical failure in two independent instances. But the stern logic of facts cannot be gainsaid, and the net result of the South Kensington experiments has been that the faithful gas has been called in again—until a perfect system of electric lighting can be discovered.

Water and Sanitary Notes.

THE answer given to Earl Fortescue in the House of Lords, relative to the London Water Supply, was substantially that which we anticipated. Sir William Harcourt's Committee recommended that an independent Water Authority should be constituted, with adequate powers to deal with the whole matter, and it is the intention of the Government, in due course, to give effect to the recommendations of that Committee. The reply containing this intimation must needs have been unsatisfactory to the interrogator, who prefaced his question by remarks which showed that he had no confidence in the proposed Water Authority. It was, he said, his earnest hope, that the Government, as a whole, did not share the views which had been expressed by one of their number—the Home Secretary—and that they were not prepared to hand over this special and important business to a body without any special qualifications for its consideration. Earl Fortescue dwelt on the inexpediency of "shaking public faith in Acts of Parliament," and reminded the House that "Capital was one of the shyest, most timid, and sensitive of creatures." His lordship hoped that nothing the Government would do would tend to discourage the application of capital to commercial undertakings, such as those with which the Water Companies are concerned. The Earl of Fife, in his reply, signified that it was not the intention of the Government to offer any fresh terms to the Companies in the way of purchase, "as the Government had not the power to deal with the moneys of the ratepayers with which such purchase would have to be made." This part of the answer seems eminently lame. Sir Richard Cross practically pledged the local rates as a guarantee against deficit, but it rested with Parliament to give effect to such a proposition. In all probability, the ex-Home Secretary was right when he said that the power thus to be given would never be called into active exercise. But there can be little doubt that it was an element in raising the value of the shares on the Stock Exchange. Altogether, this London Water Question is a curious test of the notions which prevail as to the position of joint-stock undertakings based on Acts of Parliament.

In the extended report of Earl Fortescue's speech, to be found in another part of our present issue, it will be seen that the Earl expressed his conviction "that Sir W. Harcourt, as Chairman of the Water Committee, did not treat Mr. Smith in a fair or proper manner." According to Earl Fortescue, "Mr. Smith himself complained that he had been cross-examined as if he were a witness at the Old Bailey." For these remarks we conceive there is some foundation. Mr. Smith doubtless felt that he was being examined in a spirit of antagonism; and the ordeal, extending over so many days, naturally took effect on the physical system of a man who was not in perfect health. Earl Fortescue further told the House "he had heard Sir W. Jenner say that what Mr. Smith 'had gone through before the Committee was probably fatal to him.'" Nevertheless, in fairness to Sir W. Harcourt, we must suggest that the fatality would not have occurred, had there not been other causes in operation besides the strain of giving evidence before the Committee. Mr. Smith's atten-

dance on the Committee doubtless contributed to his death; but we trust that Earl Fortescue has, in some degree, over-stated the case.

The Plymouth Town Council are just now manifesting some anxiety as to the sufficiency of their water supply, and seemingly not without reason. At a recent meeting of the Corporation, one of the Town Councillors stated that the population were living upon the supply of water which was brought into the town in the days of Queen Elizabeth, the only improvement having been the stoppage of certain leaks. Although a constant supply is professedly given, it was alleged that for several weeks past, in some parts of the town, there had been no water obtainable after four o'clock in the afternoon. Another member of the Corporation remarked that they were dependent on public opinion, which at present was not sufficiently enlightened to see the wisdom of a large expenditure for the necessary works. "The Council," said this gentleman, "were waiting upon Providence for a period of drought, when public indignation would rise against them." The argument for doing something was certainly not weakened by the observations of another Town Councillor, who "thought that statements calculated to alarm the people of Plymouth should not go abroad 'unquestioned,' and who sought to prevent a panic by stating that 'he found from the Water Surveyor that a good supply of water could be had in a quarter of an hour in case of fire.'" This gentleman had inquired into the matter a second time, and was re-assured on being informed that the interval would be "certainly not more than half an hour." Another speaker said that if Plymouth had "two fires" during a period of drought, the position would be a "very dangerous" one. It was stated that already a serious difficulty had arisen, there being "no water in the mains" on the occasion of a large fire in the town during a dry period in winter. It was ultimately resolved "that the Water Committee should take into consideration the best means of providing a more certain and copious supply of water, so as to meet the increasing demands of the town, and to be independent of the conditions of weather and season." If the Water Supply of Plymouth were in the hands of a Company, perhaps there would be no need to "wait on Providence" for an outbreak of popular indignation. A communicated article in the *Western Morning News* gives an able review of the facts connected with the question, and tends to show the necessity of constructing a new storage reservoir. It was calculated by Mr. Hawksley, and the reckoning has been supported by the Borough Water Surveyor, that it is possible in a dry summer for the Plymouth supply to fall to a minimum of one and a half million gallons per day, whereas the present consumption is at the rate of three and a half million gallons. The fallacy of providing for a mere average demand is also insisted upon, the consumption during a hot day in summer being considerably in excess of the daily average throughout the year.

The final meeting of the Cardiff Water-Works Company, on their dissolution through the purchase arranged by the Corporation, was held in the early part of the present month. The proceedings passed off satisfactorily; as well they might, seeing the good price the Shareholders are receiving for the undertaking. The manner in which the question of compensations to officers, &c., was treated deserves, however, attention. The recommendation of the Directors, though not fairly open to any charge of extravagance, was set aside by the meeting, not the least curious feature being, it appears, that this was done without any attempt on the part of the Directors to uphold their report and its recommendations in that respect. For instance, they proposed to award the Secretary, who had been in their service for 28½ years, about four and a half years salary. But this was cut down by £300. Similarly with the Engineer, who had been in the Company's employ for 18 years, their proposal was for a payment of barely three years remuneration; yet this was reduced just one-half. Considering that the Directors could, we understand, have easily carried their point, had they so chosen, it would seem that they had not the courage of their conviction, that they were lukewarm and indifferent as to the result, or that they preferred the proposition of the meeting and the reduced compensation. After agreeing to such reductions on the part of their officers, they could hardly complain of the unhandsome manner in which they themselves were treated by the Shareholders—a sum of £100 only being voted to each of them.

Littlehampton is about to secure for itself the benefit of an efficient water supply. The foundation stone of a water tower, to be 80 feet high, was laid a few days ago by the Duke of Norfolk, who was accompanied by the Duchess and several

persons of note, the proceedings terminating with a luncheon, at which the Chairman of the Local Board of Health presided. The water will be pumped up by steam power from a source which was discovered by boring, and which is considered capable of yielding 168,000 gallons a day. The present population of Littlehampton is 4000, and it is expected that this will increase somewhat rapidly. But in the meantime there are drainage works to be carried out, which it is stated will shortly be commenced. The water-works are the property of the Local Board.

The National Health Society are calling the attention of the Vestries of the Metropolis to the unwholesome condition of the streets of London in hot weather. "Intolerable smells" are said to have pervaded the streets of the West-end, and have been the subject of frequent complaint. It is suggested that the surface of the roads is not kept so clean as it might be, and that the sewers are not in all cases properly constructed. A liberal use of water for street washing and cleansing is recommended, and this, it is thought, will come to pass when the water supply is placed "under competent scientific and public control." The ousting of the London Water Companies appears to be looked upon as the great panacea for all the sanitary ills which afflict the Metropolis. We venture to think, and have often said it, that if the Local Authorities were stirred up to the performance of their duty, there would be less complaint made with respect to the water supply. At present the Companies are the scapegoats, and important improvements are complacently postponed to the period when the "Public Authority" shall be installed in all its magnificence. If the inhabitants of the Metropolis are thus content to live in hope, we trust that they will not be disappointed.

A project for the utilization of a portion of the Metropolitan sewage has been embodied in the Dagenham and District Farmers (Optional) Sewage Utilization Act, which has just received the Royal Assent. This Act authorizes the formation of a Company, and the construction of works for the delivery of London sewage to the occupiers of some nine thousand acres of land on the Essex side of the Thames, between Barking and Wennington. According to this scheme, the farmer or market gardener will have sewage only when he requires it, and, on the other hand, the Company will be under no obligation to take the sewage except when they can dispose of it. The Act confirms a thirty years agreement with the Metropolitan Board of Works, by which, in consideration of a half share in the profits of the concern (beyond the first five per cent.), the Board undertake to supply the Company with any quantity of sewage up to sixty million gallons a day. The promoters of the Company have ascertained that the most successful market gardeners in the district spend as much as £15 and £20 per annum per acre for the purchase of manure, and it is calculated that the Company will be able to supply and distribute sewage containing by analysis £20 worth of manure at a charge of £2, leaving a handsome profit for the Shareholders. The proposed works will be capable of supplying that amount to every acre of the district during the six driest months of the year. One-third of the area will be commanded by gravitation, the remaining two-thirds, consisting almost wholly of market-garden farms, will be supplied by pumping. The capital of the Company is £150,000, and the Engineer to the scheme is Mr. Peregrine Birch. The analytical value of the sewage placed at the Company's disposal is said to be about a million pounds sterling a year, but the promoters of the undertaking will be happy to sell it all for a tithe of that amount—a sum which would be about one shilling per head of the population, or perhaps rather less. A popular feature of the scheme, and one which doubtless helped to recommend it to the favourable notice of Parliament, is that it promises to divert a large portion of the northern sewage from the Thames during the hottest months of the year. The experiment is a very interesting one, and is more reasonable than any that has yet been devised for dealing with the sewage of London.

GRANTHAM GAS COMPANY.—The report and statement of accounts presented at the half-yearly meeting of this Company, recently held, showed that, notwithstanding the reduction made in the price of gas and the depression in trade, the Company was in a satisfactory financial position. A dividend at the rate of 10 per cent. per annum on the original shares, and of 7 per cent. on the new shares, was recommended. The revenue account showed a balance of £295 4s. 4d. in favour of the Company. An extraordinary general meeting of the Shareholders was subsequently held, for the purpose of authorizing the Directors to increase the capital of the Company from £30,000 to £35,000, by the creation of 250 new shares of £20 each. The Chairman—Mr. J. F. Burbridge—remarked that the new shares would be allotted in proportion to the number of shares held by the present Shareholders—one to every six old shares—and would be entitled to 7 per cent. dividend. The proposition was unanimously agreed to.

Communicated Article.

THE RELATIVE ILLUMINATING VALUE OF THE HYDROCARBON VAPOURS AND GASEOUS HYDROCARBONS PRESENT IN COAL GAS, AND THEIR QUANTITATIVE DETERMINATION.

By Mr. G. ERNEST STEVENSON, of Peterborough.

Dr. Knublauch, the Chemist at the Cologne Gas-Works, has published, from time to time, in the *Journal für Gasbeleuchtung* during the past and present years, a description of experiments made by him on the above subject, and the conclusions to which these experiments have led him.

The experiments had for their result the important discovery that equal volumes of the vapours of benzol, toluol, and other homologues of this series of hydrocarbons, give, when burned in a gas-burner in conjunction with coal gas, practically the same result in increase of illuminating power, and that they produce a result *six times as great* as that produced by the admixture of the same quantity by volume of hydrocarbon gases of the ethylene, or olefant series. To put it plainly, benzol and its homologues have a light-giving power equal to six times that of C_2H_4 , and its homologues, or the addition of one part by volume of benzol vapour will increase the illuminating power of coal gas as much as would six parts of olefant gas or other hydrocarbon gases of the same series. Light carburetted hydrogen, or marsh gas (CH_4), not possessing any considerable light-giving qualities except under heavy pressure, is classed along with hydrogen as a light-bearer, not a light-giver, and is not taken into account in these experiments. Benzol (C_6H_6) and ethylene (C_2H_4) were selected for experiment as the representatives of their series, and in order to determine the unity of each series in regard to illuminating value, toluol (C_7H_8) and ether (CH_3O) were also experimented upon.

The experiments were conducted in the following manner:—Between the meter registering the consumption of gas and the burner of the photometer at which the illuminating power was taken, was placed a flask (V in the accompanying sketch) containing the substance (when fluid) to be mixed with the gas. The inlet-pipe conducting the gas into the flask V terminated immediately above the surface of the liquid, the outlet-pipe immediately below the cork. A straight tube having two branches at right angles to the tube itself formed a bye-pass, by which the gas could be shut off from the flask, and conducted direct to the burner. This pipe was furnished with a cock, and the branches were controlled by pinch-cocks on india-rubber connecting-pieces in the usual manner. These, it is remarked, were made as short as possible, to avoid absorption of the benzol vapour in its passage to the burner. At C, a cylinder containing finely-spun glass was introduced, for the purpose of ensuring a thorough mixture of the hydrocarbon vapour with the gas.

In order to obtain a mixture of gas and vapour of sufficiently low, and also of constant illuminating power, it was found necessary to pass only a small portion of the gas over the hydrocarbon fluid in the flask, the greater part of the gas being conducted direct through the straight tube forming the bye-pass. To accomplish this, a micrometer screw was fixed on the branch conducting the gas to the flask at M. The gas was consumed at the rate of 150 litres (=3.505 cubic feet) per hour. The quantity of gas passed through the flask not having been separately measured, it could not be recorded how much gas was required to absorb the necessary quantity of benzol, but the absorption was regulated so as to increase (in the case of benzol) the illuminating power of the gas from 15.7 to 17.2 candles—being an increase of 1.5 candles. To effect this, 0.827 of a gramme of benzol was absorbed and carried forward with the gas to the burner.

The experiment was performed with the other hydrocarbons in the same manner, except in the case of ethylene. Being a permanent gas, it was necessary to mix this in definite proportions with the coal gas in a gasholder immediately previous to the experiment.

To find the illuminating value of benzol as compared with the standard sperm candle is a simple rule-of-three sum. The candle burning 120 grains per hour gives a light of 1-candle power. As the experiment was performed with gramme weights, it is necessary to convert the 120 grains into their equivalent in grammes = 7.8 grammes. Then $0.827 : 1.5 :: 7.8 : 14.15$, which is the amount of light in candles that benzol would give if it were burned at the rate of 7.8 grammes (120 grains) per hour, and in the manner employed in the experiment.

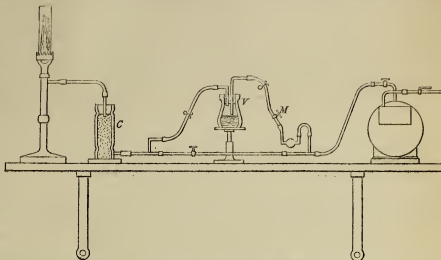
Similar experiments conducted with toluol, ethylene, and ether gave the following results as the illuminating value of each of the four hydrocarbons when burnt in conjunction with coal gas at the rate of 120 grains per hour:—

7.8 grammes = 120 grains . . . Benzol . 14.15 candles.
Toluol . 12.80 "
Ethylene . 7.24 "
Ether . 2.53 "

The molecules of substances in gaseous form occupy the same space under equal conditions of temperature and pressure, therefore a molecule of benzol vapour occupies the same space as a molecule of olefant gas. Equal volumes of different gases, then, differ in weight in the proportion of the molecular weight of their substances. The molecular weights of benzol, toluol, ethylene, and ether are as follows:—

Benzol . C_6H_6 = $12 \times 6 + 6$ = 78 These proportions
Toluol . C_7H_8 = $12 \times 7 + 8$ = 92 by weight occupy
Ethylene C_2H_4 = $12 \times 2 + 4$ = 28 equal space in
Ether . C_2H_5O = $12 \times 4 + 10 + 16$ = 74 gaseous form.

If we take the illuminating power developed by 7.8 grammes (120 grains) of each substance, and express the molecular weight of



each substance in grammes, and suppose that weight of each substance to be consumed per hour, and then calculate the proportionate illuminating power developed by each substance under these conditions, we shall arrive at the relative light-giving value of equal volumes of the hydrocarbons under consideration:—

Benzol	C_6H_6	= 78 grammes	= 141.5 candles	Relative illuminating value of equal vols. of vapours and gases.
Toluol	C_7H_8	= 92 "	= 151.0 "	
Ethylene	C_2H_4	= 28 "	= 25.9 "	
Ether	C_2H_5O	= 74 "	= 24.1 "	

It will be readily perceived that very little difference exists, comparatively, between the resultants for benzol and toluol, and again a still slighter difference between those for ethylene and ether. When it is considered how very slight errors in the experiments may have multiplied in working out the results, the value of the four hydrocarbons thus expressed may be well taken to represent multiples of 24. If instead of 141.5, 151.0, 25.9, 24.1, we substitute the figures 144, 144, 24, 24, we find that the value of benzol and toluol is the same for equal volumes, and that it is six times as great as that of C_2H_4 and C_2H_5O , which have also an equal illuminating value the one with the other.

That this is in accordance with, and bears out the theory of illumination, may be shown in the following manner:—Inasmuch as the light given out by the combustion of a carbon-containing substance results from the carbon which is set free and becomes incandescent, it follows that, given equal conditions of combustion, the quantity of carbon set free is proportionate to the light produced. Thus, out of a molecule of C_6H_6 , there would be six times as much carbon set free as out of a molecule of C_2H_4 .

The following table shows the relative proportions of carbon contained, and the quantity set free in combustion, in the case of each of the four hydrocarbons in question, and also the illuminating value of one molecule expressed in grammes of each substance:—

Symbol.	Molecule in Grams.	Carbon contained in Molecule.	Carbon set Free.	Per Cent. of Carbon set Free.	Atoms of Carbon set Free.	Illuminating Value of One Gramme Molecule.
C_6H_6	78	72 grammes.	72 grammes.	100	6	144 candles.
C_7H_8	92	84 "	72 "	85	6	144 "
C_2H_4	28	24 "	12 "	50	1	24 "
C_2H_5O	74	48 "	12 "	25	1	24 "

If it be asked how it comes to pass that, while in the case of benzol the whole of the six atoms of carbon are set free and thus rendered available for illumination, in the case of ethylene only half, and in the case of ether only one-fourth of the carbon is set free, the reply is, that this results from the chemical constitution of the substances. The dissociation, or splitting up of the constituent elements must take place in accordance with the laws of chemical affinity. As compound organic substances split up into simpler groups that displace one another or hydrogen, which becomes free, so the hydrocarbons break up, under the action of heat, into simpler compounds and carbon, and as they differ in the mode of the combination of their elementary atoms, it is quite intelligible that they should differ in the mode of dissociation.

In the case of olefant gas or ethylene there is a division into marsh gas and carbon ($CH_4 + C$). The carbon brought into incandescence *in statu nascenti* is the source of light, while the CH_4 becomes oxidized into CO and H_2O . [It is true that C_2H_4 , if exposed to a white heat, becomes broken up at once into hydrogen and carbon. In combustion from a burner, however, this heat is not approached.] Similar divisions take place in the first instance in the case of all combustible substances. In the case of benzol all the carbon becomes free, and contributes to the production of light.

The quantitative analysis of benzol might be indicated by the formula CH ; but as the density of its vapour is 39 times that of hydrogen, it is taken to consist of a group of six trivalent CH radi-

by bromine amounted to 17 per cent., gives, on application of the formula $x = \frac{1}{5} \left(\frac{1}{1.466} - 8 \right)$, a percentage of 1.34 of hydrocarbon vapours, while the remaining 15.66 are gaseous hydrocarbons of the C_2H_4 series.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE TOTTENHAM COURT ROAD EXPLOSION.

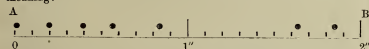
SIR,—The want of clearness which you remark, in your friendly notice of my report on the Tottenham Court Road explosion, in the case which deals with the probability of an explosive mixture being found in the main, is due, I think, to an unnecessary stop. There should be neither comma nor semicolon after "degree," in the second sentence quoted. The meaning, stated more briefly, is that it was not unlikely an explosive mixture would be found in the main unless it was unlikely that the valve should have leaked as much as one cubic foot per hour.

I notice two other small errors in the printed report. "Cubic foot" should be struck out from the last sentence of the preceding paragraph; and 110 in the second table should be — 110. A. VERNON HARCOURT.

Duffry, Aberdare, Aug. 20, 1880.

SIR,—The intervals of time between the successive explosions in the Tottenham Court Road accident have not, it seems, been explained in a thoroughly satisfactory manner. I give the following view of the question as a simple and logical explanation.

It being granted that the gas mixture was of uniform composition throughout the main, I believe the explosion to have acted instantaneously, or nearly so, on the whole length. Assuming the seven explosions to have been simultaneous, I say that *even then* it is impossible that one should have heard but a single sound, and that the succession of "thuds" spoken of by one of the witnesses at the inquest is a mere consequence of the law of propagation of sound. A person standing at the corner of Bayley Street at the time of the accident would first hear the explosion at that point. A simultaneous explosion taking place at the crossing of Howland and Charlotte Streets would only reach such a person's ear an appreciable time afterwards, owing to the sound having to travel over 2075 feet at the rate of 1125 feet per second, or thereabouts. The accompanying diagram will roughly illustrate my meaning:—



Let A B represent two seconds of time divided into tenths. The seven different simultaneous explosions will reach Bayley Street in succession, as shown by the black spots on the diagram. Two seconds for the whole succession of sounds will not be considered as too short a time, if one can only need be raised. I am sure that "witnesses are apt to overrate the duration of any sudden and remarkable occurrence." A. SALANSON, C.E.

Nines, Aug. 20, 1880.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, AUG. 16.

METROPOLIS WATER SUPPLY.

Earl FORTEUCE, pursuant to notice, rose to ask: "Whether, considering the injury caused to the public health in the Metropolis by the stagnant detention of water in butts and cisterns on the intermittent system of distribution, considering the excessive loss of life and property there caused by the same system, and considering the high and increasing rates paid for such water supply, the Government have offered any other terms for the purchase of the Water Companies works, now that the terms lately proposed have been rejected; and whether, in the event of the non-acceptance of such other terms, if offered, the Government are prepared to take compulsory measures to arrest the continuance of the evils declared by several successive Parliamentary Committees and Royal Commissions to arise from the existing conditions of the Metropolitan Water Supply." His lordship said many years ago it had been laid down as a sound principle by sanitary reformers, and especially by the Commissioners appointed to inquire into the health of towns, that an improved water supply was as indispensable even as sewerage and house drainage—that neither could be efficient without the other; that the water, however pure the source of the supply, was sure to become contaminated by stagnation in foul cisterns and by decaying water-butts. He had often seen water supply with an indolent scum upon it, and it was sure to be unpalatable as practically to repel any one from using it as a drink, even if it was not unwholesome when employed in cooking or for making tea. The report of the Health of Towns Commissioners gradually had a quiet influence upon the public mind, and saved the way for the uprooting of a mass of ignorance and prejudice. This report had been opposed by many of the Municipalities, and by almost all the Vestries in London; but as it appealed to sound economy as well as to humanity, it gradually took on the most enlightened and benevolent, and it encouraged Lord Morpeth to bring in his measure for the consolidation of the sewers, and the year following the Public Health Act had already been considered by far the best sanitary measure ever passed—viz., the Public Health Act of 1848. The General Board of Health, in their first report on the Water Supply of London, made the following recommendations. They proposed that the sources of supply for London should be springs instead of the River Thames; that cisterns should be superseded by a constant supply of water at high pressure; and also that in connection with this constant supply at high pressure the streets should be hydranted. The Board suggested that the water supply should be put under some public Trust, and that the Water Companies should be paid their existing dividends, with further compensation for prospective value. If that report had been then acted upon, the capital of the Water Companies amounted to only £6,000,000; their dividends were only, on an

average, 5 per cent.; and now they know that it would be very cheap to take them at the rate of 10 per cent., which was the statutory limit of their profits. In consequence, the rates would have been reduced from £350,000 a year, resulting in great part from the consolidation of many of the Companies, and a whole generation would have enjoyed the benefit of an improved water supply, and increased protection from fire by the system of hydrants at constant pressure, and two-thirds of the lives that had been lost from fire, and two-thirds of the property that had become serious, would have been saved by a system which, from the experience of Manchester, enabled water to be applied in less than five minutes, instead of, as under the other system, with turncocks, in something like 15 minutes. The melancholy part of the present system was that, with an inferior supply, there was merely a small portion of it delivered at high pressure, not from the reluctance of the Companies to furnish it, for they said they were quite ready to comply with their statutory requirements in this respect; but they wanted better legislation and better management by the local authorities, to introduce as a matter of course to every house a supply of high pressure, which in many towns had been provided, with all the special fittings necessary, and these had been fixed up by some public authority who spread the cost of them over a series of years. They were paying much more for this inferior supply, delivered in an inferior manner, than people paid in Manchester, Liverpool, and Glasgow, where the recommendations of the Board of Health had been acted upon. He was happy to find that one municipality after another was recognizing the great importance of having the gas and water under their own control; but they were paying for their tardiness in buying up the companies undertakings. They were rudimentarily establishing something like a public utility, but they were doing it in a very inferior way. A variety of duties and functions which used to be discharged by a number of other departments had been treated separately by the Local Government Board. It had a costly but very efficient staff connected with it for dealing with sanitary matters—viz., a Sanitary Engineer, Medical Officers of Health, and a Water Engineer and Auditor. And in the Local Government Accounts. When this great water question arose, it was allotted not to the head of the department constantly engaged in that work, but to the Home Office, which chiefly concerned itself with police and certain quasi-judicial functions. It might be said, and indeed it might be said, that the question was so important that it was carried over to the Home Secretary because he was a Minister of recognized ability, and a Cabinet Minister; but Sir Richard Cross had no experience in sanitary matters, and there was no one in his office particularly conversant with them. No wonder that, able as he was, he committed himself to views which were very far from sound. When the Government came into office, there was a right honourable gentleman who seemed specially qualified, from his having been one of the Health of Towns Commissioners, and who had been selected to be Chairman of the Committee on the Manchester Corporation Water Bill. This gentleman was appointed Chairman of Committees—mentioned which he had no particular training, and who had never carried out water had great experience in that office, but whose name had never been mentioned in connection with sanitary administration, was sent to the Local Government Board. The matter was referred to the Home Office, where there was a gentleman who was a most able and eloquent Queen's Counsel, but who had had no administrative experience, except such as he had obtained as a Law Officer of the Crown. No one could be surprised, therefore, at Sir William Harcourt, notwithstanding his great ability, falling into the same glaring financial error as his predecessor. One of Sir R. Cross's errors was in declaring that capital would require to be raised. The fact was, that no capital need be raised. The rates that were now levied upon the ratepayers would have sufficed to continue the dividends to the Water Companies, from the immense economies resulting from the unification of administration, and as a consequence of the practicability of ceasing to employ some of the least advantageously situated works, which were now carried on at a cost of £170,000, and that would have sufficed to pay for all prospective advantages, and have left a margin for cleaning the streets and making other improvements, and affording better protection to life and property from fire, in regard to which London was so defective as compared with other towns. He did not wish to be understood as standing up for the present agreements with the Water Companies, for he was not sufficiently conversant with the matter to pronounce an opinion upon it. He would only say that the liability of the Companies to provide a constant supply of water at high pressure on the basis of the rates then taken in the purchase was to be paid for prospective advantages. The other great financial error that both the Home Secretaries seemed to have fallen into was this—viz., that the market price of the Water Companies shares at a certain time ought to be taken as a basis for the purchase. The market price of the shares was no necessarily safe guide to their real value, and as only a very small proportion of them were ever put up for sale, such a basis might lead to serious miscalculations. The system of purchase which, he believed, had always been practised in provincial towns, and which was followed by the Local Government Board, was that of paying for the shares on the basis of the company's value at the time of purchase, and length of time, and adding to it any prospective value which they could substantiate, with something for compulsory purchase, and deducting from it any very heavy prospective expenses arising from any marked or glaring deficiency in the condition of their works. In the case of the Local Government Board, the shares were taken on the basis of the current value, because the Government Auditor had access to all the books, and he exercised a very clear control over the Companies dividends, and over the profits on which those dividends were based. From the report of the Committee there seemed to be an indication of an opinion that the fluctuations in the value of the shares were not to be taken into consideration; but it must be remembered that the value of those shares something like doubled in a very short space of time, and some of the Companies increased their dividends from 2 to 7½ per cent. The market price of shares as the basis of valuation was a *reductio ad absurdum*, and could not be maintained. There was no doubt that the shares were a "stable market," and the real value of the stocks was not indicated by the quotations on the Stock Exchange. He remembered some years previously a rumour being circulated that Spain was endeavouring to turn to account the depreciation of her funds caused by her own bad faith, and was making some profits in paying off the interest on the debt at low prices. This was merely a rumour. The argument it furnished, however, was conclusive against taking the market value of the shares as the right basis for purchasing these great Companies monopolies. It had been said that the power of taxation in these Companies was almost unlimited. This was the case, but the Companies were not at all low priced. The Companies were put to great expense in seeking to bring water from long distances, in providing filtering-beds, in raising the water to the tops of the highest houses, and in supplying an average of 32 gallons per head per day to the population of the Metropolis. To charge them with more than about three-quarters of a farthing per head per day, though this was greatly too much as compared with the rates in many towns, and an additional farthing would give them the utmost

limit of their statutory dividend—namely, 10 per cent. The real thing to be sought was to arrest, as soon as possible, the constantly growing charges of the Water Companies. These were put by the late Mr. Smith at over £1,000,000 per annum—not far from £3000 per day; and here he must express his conviction that Sir W. Harcourt, as Chairman of the Water Committee, did not do his duty in not doing so in a more proper manner. Mr. Smith himself complained that he had been cross-examined as if he were a witness at the Old Bailey, and his wife—unhappily now a widow—said that it had been too much for him; and he (Earl Fortescue) had heard Sir W. Jenner say that what Mr. Smith had gone through before the Committee was probably fatal to him. They found the Home Secretary resisting a resolution for making terms of purchase, and he declined to undertake the duty; and then he suggested to the Committee to entrust this duty to a combined body of representatives from the Metropolitan Board of Works, whose abortive attempt at water legislation cost the ratepayers so much money, and which was condemned as wasteful and inefficient by the Fire Brigade Committee, and whose leading financial witness showed himself so very incompetent before the Water Committee—of representatives from the City Corporation, whose financial views Sir E. Beckett showed were by no means sound; and, lastly, of representatives from the Vestries. It was to a body of this sort, without any special qualifications for dealing with this particular case, that the Home Secretary proposed to entrust the work. Sir W. Harcourt, at a dinner of the Metropolitan Board, spoke of their works as being "dirty cheap." The Chief Engineer of the Local Government Board, however, spoke of them as being "cleanly and well sewered and well managed." The Home Secretary, and suggested that it should be sewered on better principles, at less than the cost of one of those gigantic outfall sewers. They had had floods in the Metropolis, and they had mud-banks in the river, and the diffusion of noxious gases had been severely criticized by *The Times*. He would not say, by any means, and he would not say, by any means, that the Bazillette, whose origin appeared to be a waste of money, that he was led to believe that this gentleman was altogether fit for the very important post that he occupied; and as to considering the works of the Metropolitan Board as "dirty cheap," he thought the ratepayers of the Metropolis had very great reason to regret the enormous increase of rates which the Board had caused, and the Home Secretary, who the Government did not share the views of the Home Secretary—that they were not prepared to hand over this very special business of water supply to a body with no special qualifications for it; and he ventured to assure them that the very highest qualifications would not be too great, if they would employ an arrangement for purchasing the water from the Water Companies undertakings, and preparing the way for a more satisfactory system of water supply under the responsibility of the Government. The language of the Home Secretary, in the report of the Water Committee, had caused some alarm to those who had investments in undertakings controlled by the Government, and he would not say, by any means, that the words of a correspondent of *The Times*, who said, "Faith in Acts of Parliament has heretofore been inherent in Englishmen's minds; but if a railway, water, or any public undertaking, established by private enterprise on the faith of Acts of Parliament, be covered by any section of the public, and such action say they will only give what they choose, and that if it is not to be carried out, it will be made of ruin them, by competition carried on with the public resources, there is an end of all public honesty, and of confidence in parliamentary grants." Could there be a doubt of this? He earnestly hoped that nothing would be done to drive away capital, or discourage its application to commercial undertakings, and therefore put the question of what he had given to the public.

The Earl of Fitz: The Government do not understate the importance of the sanitary questions to which the noble Earl has alluded, and which affect very greatly the health of the inhabitants of the Metropolis; nor, indeed, is a continuous and abundant supply of water less necessary for the protection of the public health than a sewerage system. I would point out to the noble Earl that the report upon which his question is founded has only been published about a week, and therefore, considering the very great difficulties which surround this question, I do not think it will be deemed unreasonable if I say that the Government are not prepared to immediately deal with the question which the noble Earl has put. The noble Earl asks whether it is the intention of the Government to offer any other terms for the purchase of the Water Companies works. I may say that it is not their intention to offer any fresh terms, as they have not the power to deal with the monies of the ratepayers, out of which such purchase would have to be made. I have given no answer to any part of the question, I may say that the Committee of the House of Commons which sat upon the whole question of the Water Supply of London recommended that an independent Water Authority should be constituted, with adequate powers to deal with the whole matter, and it is the intention of the Government to give effect to the recommendations of that Committee.

ASHFORD GAS COMPANY.—The annual meeting of this Company took place on Monday, the 9th inst.—Mr. Bugler in the chair. The Directors report, which was presented, recommended the payment of a dividend of 7½ per cent. to the Shareholders, and that the price of gas to private consumers should be reduced 2d. per 1000 feet (making the price 4s. per 1000 feet) on the 1st of July. The last dividend was paid on the 1st of July. The report was re-elected, as were the Auditors (Messrs. Davis and Thorpe).

THE BREAKING-UP OF ROADS BY NON-STATUTORY GAS COMPANIES.—In the course of the week before last the Lintilhgow Gas Company, in order to make a request for an increased supply of gas from certain inhabitants, proceeded to take up certain parts of the street for the purpose of laying new pipes, without, it is alleged, having obtained the necessary permission of the Commissioners of Police. The latter, deeming this an unwarrantable encroachment upon their rights, at once presented a petition to the Sheriffs for interdict against the Gas Company, asserting that the whole of the streets were vested in them, and that no one had any right to take up any part without their consent, and at the same time stating that the Lintilhgow Gas Company, without their permission, they would at once have allowed them to proceed with their operations. After hearing the parties when the case was called on Monday, the 16th inst.—when the Gas Company maintained their right as against the Commissioners, under a minute of the Town Council of 1851, giving the authority to lay pipes in the streets, the Sheriff Home issued interdict, granting interdict, as craved, and to this a note was appended, stating that the Sheriff-Substitute was so satisfied that the permission granted to the Gas Company to open the streets for the laying of their pipes on the first occasion, in 1851, could be construed as applying only to that period of the Company's operations, and that the Commissioners of Police of the burgh were so immediately and directly answerable for the state of the streets of the town, and for any operations upon them involving the convenience and safety of the inhabitants or of the traffic upon them; that he considered it his duty to grant interdict interdict against the Company, this proceeding, and that he considered that a contrary construction must be given to the previous permission, or that a right of interfering with the Commissioners responsibility had been acquired by another party.

Miscellaneous News.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

A Quarterly Meeting of this Association was held on Thursday, Aug. 12, at the Guildhall Tavern, London.—Mr. J. HUNTER (Woolwich) in the chair. The HONORARY SECRETARY (Mr. J. L. Chapman) read the minutes of the previous meeting, which were confirmed.

Mr. Broadbent (Waltham) was elected a member of the Association. The SECRETARY read a letter which had been received from the Institution of Civil Engineers, asking for a copy of the proceedings of the Association to be placed in their library. Whereupon, Mr. ELDRIDGE (Richmond) proposed that a copy be sent as requested. This motion was seconded by Mr. BROADBENT (Tottenham), and carried.

Mr. A. F. WILSON then read the following paper on—

HISLOP'S PROCESS OF RESTORING SPENT LIME.

"The saving of refuse material is one of the grand objects upon the achievement of which the progress of manufacturing industry (to a great extent) depends, and it ought to be, and usually is, a prime consideration in every branch of manufacture." This is an extract, slightly modified, from an article by Mr. R. H. PATTERSON, published in *Engineering* in May, 1877, and the writer thinks it forms an appropriate beginning to a paper of this kind.

The restoration of spent purifier lime is not new. We have it in history that the "blue billy" was re-burned, and that the larger quantities of lime required when what is known as the "dry lime system" came into general use, produced experiments in this direction with the object of effecting a counterbalancing economy. The writer in 1865 restored at the Paro Gas-Works upwards of 20 tons of spent lime, which was re-used for purifying the gas.

A method of doing this, at once successful and economical, has not hitherto, however, been brought before the gas world, and in claiming both success and economy for Mr. Hislop's process, the evidence lies before of full three years containing action at the Falsley Corporation Gas-Works—works of sufficient importance to place the question of its application on a large scale beyond dubity.

The use of lime in the case of London and towns working under what may be called the "sulphur clauses legislation" is especially necessary, as the utility of the gas is for much as the gas is consequently more clearly apparent. The object of this paper, therefore—while having in view the facility in this way manipulating lime as a purifying agent under any circumstances—is more directly aimed at showing the advantages and economy which would accrue by the use of Hislop's system where the employment of lime is not essential.

The first part of Mr. Hislop's system lies in the arrangement of the mode of purification. This, it is needless probably to observe, is not a part of his patent; nor, although by attention in this way substituting labour may be avoided, is it essentially a part of his arrangement. The purification is managed so that the sulphuretted hydrogen may be driven off in a continuous stream, the gas being, during the process, the spent lime is taken out in a very great proportion as carbonate. This spent material is then conveyed to the restoring ovens shown in the engraving, where a charge of about 15 cwt. is introduced to the upper retort. It is found practically impossible, or at least difficult, to get up a strong heat upon this upper retort, because, the charge containing as it does a proportion of aqueous vapour, a considerable absorption of latent heat ensues on its dispersion.

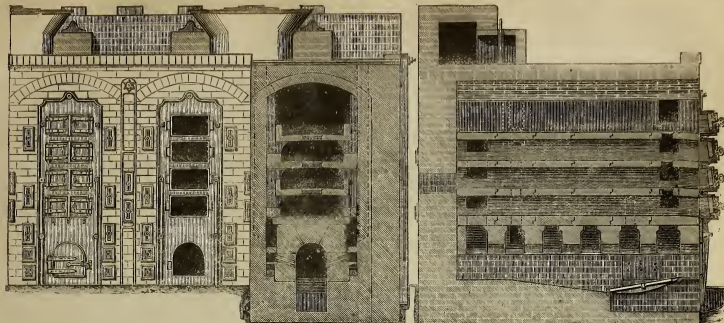
Six hours are allowed to elapse in this first operation, during which the furnace gases play within the retort, and the mass is occasionally stirred, thus driving off the sulphur compounds which it may contain, and thoroughly drying for the final burning. At the expiration of this period the charge of the top retort is drawn and distributed over the three underneath; the top retort being immediately re-charged with spent material from the purifier as before.

At this stage the continuous action may be said to commence. The resulting high temperature, the high temperature, the upper oven, and the lime readily parts with its carbonic acid, which, on its way to the chimney, passes over the charge contained in the upper retort, and displaces by affinity the sulphur compounds therein contained. The charges of the lower three retorts are at the end of six hours (or twelve hours, according to the extent of the material previous to drying, and it is found advisable immediately to slake and stack it as hydrate ready for the purifiers. The resulting hydrate closely resembles that obtained from ordinary lime shell of the same kind, but contains a slightly increased percentage of sulphate of lime, magnesia, oxide of iron, alumina, and silica. The residue, which is the spent material previous and subsequent re-burning, shows in its analysis (which is appended) that the hundredth restoration very closely resembles the seventieth; that the hydrate in the hundredth, as compared with the original, had diminished about 8 per cent.; and that the proportion of carbonate to sulphide of calcium in the spent lime at the first analysis was 49.98 to 1.01—not, the writer thinks, an unusually favourable proportion for operating upon. It will also be observed that the hundredth restoration showed over the seventieth a slight decrease in sulphate of lime, magnesia, and silica, and only an infinitesimal increase in oxide of iron and alumina, and that the sulphate of lime, alumina, and silica, at the end of the last operation, were approximately 77.0, 3.4, and 7.57 per cent. The chimney gases also analyzed by Dr. Wallace show only 0.305 of a grain of sulphuric acid per cubic foot—a result, he remarks, agreeing almost exactly with the average composition of chimney gases from boiler furnaces.

The cost of lime prepared in this way, or by the ordinary method, is, according to a Committee of the Society of Scotland Association of Gas Managers, published in the *JOURNAL OF GAS LIGHTING* of the 29th of June last, 6s. 3-4d. per ton, counting wages, fuel, interest, and renewal of plant; but the cost of fuel essential in this calculation will be affected by the locality, and the calculation can only be given as a guide. The evidence of Dr. Wallace as an Analyst, and of such a Commission as reported on the economy of the process, will, the writer thinks, satisfy unprejudiced minds that the chimney gases are innocuous, and that the reproduction of lime in this way is cheaper than by purchase of fresh material.

The question remains whether the sulphate of lime and what may be called the other inert ingredients so deteriorate the hydrate as to make the expense of labour in removing and replacing these inactive substances in the purifier greater than the saving effected by the use of the "dry lime" process. It is the lime produced as good as new lime. In its simple form, this question is certainly more concise; but the solution depends upon the more complicated consideration of the analysis.

The inactive materials, it will be observed, do not accumulate. They are probably destroyed and re-formed at each stage of the process, and are probably destroyed and re-formed at each stage, probably resolves itself in the purifier into sulphates and sulphides, and these are in due course driven into the oxide of iron purifiers. It is, besides, well known that the hydrate from fresh lime is not completely destroyed, in ordinary working, by one



FRONT ELEVATION.

SECTIONAL ELEVATION.

TRANSVERSE SECTION.

course of purification; that a proportion is practically inert; and that in at least one large gas-works it is considered profitable to remove the lime, and, after ventilating it for some time to the atmosphere, to replace it in the purifiers. The effect of this process seems to be simply to bring the unspent hydrate into operation, to which the gas had not previously obtained access.

It is questionable, however, whether the sulphate, alumina, silica, &c., in the analysis of the seventieth or the hundredth restoration of Mr. Hislop's lime, should be considered altogether useless substances in the process of purification. That they are neither properly so called inert nor inactive is proved by their non-accumulation. They break up and re-combine with some other bodies, and the destruction of the sulphate at all events seems to show that an additional portion of sulphur in one shape or another is absorbed in the fresh compounds which are formed.

The question next to be considered is cost of plant required for the system. It should at once be recognized that if the process, after due study, appears worthy of a trial, it should be tried under fair conditions. These conditions require that the work should be carried on so that it may not interfere with and give rise to complaints from the other departments of the factory. Consequently, a separate house or shed is necessary, the construction and cost of which need not be specially explained. Spare sheds are sometimes available, in which case this part of the expenditure would be saved. Within such a shed the calcining bench of retorts may be erected, as shown in the engraving. Each double bench properly constructed is equal to the calcination of three tons per day, and the cost of erection would (varying according to locality) be about £75.

In conclusion, one or two points only remain to be noted. Nearly all gas-works in England now use oxide of iron for purifying their gas from sulphuretted hydrogen. There are still possibly a few which use only lime. To these it may be necessary to explain that the presence of a large amount of sulphur in the lime would, after a time, cause a considerable accumulation of sulphate of calcium, which, no doubt, would interfere in their case with the economical working of the system. The remedy in such cases is obvious, and need not here be further explained.

The lime calcined by this process is excellent for building purposes, so that where a large deposit of old material has been buried upon the works, it may profitably be dug up and burned for building operations on the premises, or for sale to neighbouring builders; also, if it should become desirable to renew the stock of lime by a better quality, or for any other reason, the value of old stock may be realized in this way.

The repeated restoration seems to increase the caustic properties of the lime, and thus render it more valuable as a building material. To try this several experiments have been made with almost unvarying results. The samples upon the table show the lime as a building mortar, or, as it appears, almost as a cement, the cohesive test in one case having shown 34·6 lbs. per square inch before the pieces of brick exposed to the strain were sundered.

With reference to the relative economy of the process for poor and rich limes, experiments have also been tried, the result showing that with the same amount of labour and fuel a much larger quantity of poor than of rich lime can be restored per diem. This maintains the relative economy of the process in the treatment of these various compounds of calcium, the poor being the cheaper material originally, but costing less to restore. Scotch has been considered in these experiments as poor, and Irish as rich lime; but the principle is probably also applicable to all other varieties.

The following is Dr. Wallace's "Report on the Lime recovered from Gas-Works Waste Lime by the Process patented by Mr. G. R. Hislop, F.C.S., Gas Engineer, Paisley."

"138, Bath Street, Glasgow, April 25, 1879.

"I have made careful chemical analyses of samples of the lime recovered by the process patented by Mr. G. R. Hislop, Engineer of the Paisley Gas-Works, from the waste lime resulting from gas purification, and have obtained the results noted below. I have also analyzed a sample of the lime after being fouled for the first time, and which has been retained till now in a closely-corked bottle, and give the composition for comparison, together with that of a sample of the original pure lime. Each of the three samples of quick lime was slaked preparatory to being used in the purifiers—

	Seventieth Restoration.	Hundredth Restoration.	Original Lime, Pure.	Spent Lime, First Fouling.
Hydrate of lime . . .	65·64	69·73	77·82	..
Carbonate of lime . . .	2·07	2·43	7·16	46·98
Sulphate of lime . . .	7·00	2·70	..	8·33
Sulphide of calcium, &c. . .	..	..	..	18·91
Magnesia	·62	·59	·60	·42
Oxide of iron	1·63	1·96	·32	·70
Alumina	2·68	3·00	·64	1·00
Silica	·93	·737	2·70	2·95
Water	8·68	4·93	9·73	19·41
	99·22	99·95	100·00	100·00

"These results show conclusively that by this process the lime used in gas purification may be restored over and over again to an almost unlimited extent. The small quantities of sulphate and silicate of lime do not appear to impair the efficacy of the product in any sensible degree for the purification of gas, while for certain purposes for which lime is used they add to its value. Thus the lime may be used for months or years in a gas-works, and afterwards disposed of, if required, at its full value for building purposes or agricultural use.

(Signed) "WILLIAM WALLACE."

Discussion.

MR. BRADBURY asked if Mr. Wilson found that 6s. 3d. was the total cost per ton of lime.

MR. WILSON said the Committee gave the cost at 6s., but of course it would vary with the locality. He thought it could be done at Tottenham quite as cheaply as this. It did not take much coal—only a little to keep up a blaze.

MR. MAY asked if coal or coke were used as fuel.

MR. WILSON said a mixture of both. It required a little coal to keep up the flame.

MR. MAY asked what the cost of the coke was at Paisley.

MR. WILSON replied that the coke cost less, but it gave much inferior results to what might be counted upon from English coke, so that the difference in price would be counterbalanced by the difference in value. Less coke would do in the South.

MR. ELDRIDGE said Mr. Wilson had made one very important statement in his paper. What they had all feared with regard to this system had been offensive effluvia in the chimneys; but he gathered that there was really nothing to be feared on this account.

MR. WILSON said he could only give Dr. Wallace's statement that the quantity of sulphuric acid was only 0·305 of a grain per cubic foot, which corresponded almost exactly with what was found in ordinary house chimneys. This was rather a curious thing, because as the sulphur no doubt existed, they wondered where it went to. He fancied the sulphur formed sulphate of lime by a combination with the oxygen of the air. There was no doubt a portion of air passing through the retort, the furnace gas not being entirely carbonic acid, and his idea was that the oxygen of this air combined with the sulphur and formed sulphate, and that the hydrogen combined with the nitrogen of the air to form water, and went off in steam.

MR. GODDARD remarked that if sulphate was formed there must be some base.

MR. WILSON: The base will be sulphur.

MR. GODDARD: It will be a sulphate of some base.

MR. WILSON: It will be sulphate of lime.

MR. GODDARD asked if this would be given off; would it not remain in the furnace.

MR. WILSON said it appeared in the restored lime as sulphate, but it did not seem to accumulate. The first restoration should give as much sulphate as the last.

MR. GANDON said it depended a great deal upon the extent to which the lime was carbonated in the purifier. He was at Paisley about a fortnight since, and he found that Mr. Hislop used very large purifiers compared with the size of his works. It was well known that if foul gas was passed through lime it would at first take up both sulphuretted hydrogen and carbonic acid, but it had a preference for carbonic acid; but if you went on passing gas containing carbonic acid, it would take up carbonic acid, and no doubt this would drive off the sulphuretted hydrogen, and convert it into carbonate. The only difficulty which had occurred to him was that if there was much of this being driven off, Dr. Wallace ought to have found more coming out of the chimney. It was possible for them all to obtain this acid if they only used sufficiently large purifiers. Mr. Wilson explained a point which had often occurred to him (Mr. Gandon) before, that if you burned sulphide of calcium you would get sulphate of lime, which was useless as a purifying material; but by the foul moist lime being put into the upper chamber, where the products of combustion passed over it, it condensed a large amount of carbonic acid, and no doubt this would drive off the sulphuretted hydrogen, and convert it into carbonate. The only difficulty which had occurred to him was that if there was much of this being driven off, Dr. Wallace ought to have found more coming out of the chimney.

THE PRESIDENT said apparently the sulphur was driven forward into the oxide purifier, and hence the lime was removed as carbonate of lime, which was innocuous as far as any nuisance was concerned. He should have been disposed to think there would have been a higher percentage of sulphur in the escaping gas than 3 per cent.

Mr. GANDON said it was not 3 per cent., but one-third per cent.

Mr. WOOD said he supposed Mr. Hislop used oxide purifiers afterwards. Mr. WILSON said Mr. Hislop's process was very similar to the one recommended by the Metropolitan Gas Referees. He had four purifiers of a fairly large size, which was desirable for other reasons. One was a lime purifier, the next an oxide of iron, the third lime, the fourth oxide, and so on. The gas was first passed into either of them, it did not matter which, and then went through the others. There was one out of action, he believed; but, at all events, if the gas went into the lime purifier first, the lime became carbonate, and the sulphur passed on to the oxide. Then sufficient sulphur passed from the second purifier to the third, which was a lime purifier, to make the lime sulphide of calcium, and this took out the other sulphur compounds. Then the gas was either completely purified in these three purifiers or the purification was completed in the fourth and went on to the next.

Mr. WOOD asked if the fourth purifier would be oxide.

Mr. WILSON replied that it might be lime.

Mr. WOOD said his puzzle was to know what became of the sulphur.

Mr. WILSON said it was driven off into the oxide of iron purifiers.

Mr. WOOD said the oxide purifiers appeared to be necessary.

Mr. WILSON said for those works which did not use oxide of iron the remedy was very obvious—it was really to use oxide of iron.

Mr. WOOD said he was anxious to find out how the process could be carried on in works where no oxide of iron whatever was used, but only lime. Sulphur was given out, and there was no way of getting rid of it to take it, where did the sulphur go to at the last, if it was not found in the chimney? If oxide of iron was used they came back to some of their old points again.

Mr. WILSON said in that case either oxide of iron purifiers must be used all along with the lime, or the lime must be changed to oxide of iron, and a sulphate of lime, a special process must be employed in the restoration, and it must be driven off with carbonic acid, which could be manufactured in any way most convenient.

Mr. WOOD again asked what would be the process of revivifying lime, provided the lime was not for purchase.

Mr. WILSON said in that case they must call in oxide of iron in the restoration system. They might manufacture carbonic acid from lime, and pass it over the lime. They could use acid with the lime to make carbonic acid, and could drive that through the compound of carbonic acid and sulphide, and then drive the sulphur into an oxide purifier, which would have proved all right, although it might not be used in the system of purifying the gas. But this was not a point which he cared to take much notice of, because in small works there were so many little things to be taken into account. The system was practically most useful for works where oxide of iron combined with lime was used.

THE SECRETARY said he had seen this process in operation about a fortnight previously, and one thing he noticed about the lime was that when it was removed from the retorts and slaked it increased very considerably in bulk. It swelled completely directly water was placed upon it. He believed that it increased rather more than twice its bulk.

Mr. GANDON: Two and a half times.

Mr. BROADBERRY said that would be about the increase in good lime.

Mr. MAY said ordinary lime increased to twice its bulk when being slaked.

THE SECRETARY said this increased more than that. Mr. Hislop considered a part of his process to be to take lime and oxide purifiers together, but there would be some difficulty where a proper arrangement was not made for driving the sulphur on to the oxide purifiers.

Mr. WOOD said he experimented very many years ago, when working with lime only, to see if he could revivify it; but apart from oxide he failed in doing so. He was not anxious to know, if there was no oxide in operation, whether the lime itself would part with the sulphur so as to be fit for use again.

THE PRESIDENT said his own experience agreed with what Mr. Gandon had said just now, that by continuously passing the gas which contained a percentage of carbonic acid through lime a large proportion of sulphur was driven away, and it became carbonate of lime.

Mr. GANDON observed that Mr. Hislop, at the recent meeting of the British Association of Gas Managers, referred to the process which he had adopted when he found there was much sulphuretted hydrogen in the lime. He had used the gas from the retort chimney through the lime, in order to convert it into carbonate, and then he took an oxide of iron purifier to arrest the sulphuretted hydrogen that was given off.

Mr. GODDARD said he had been working some purifiers lately, and he could not tell them out of the argument. He tried first of all working with lime purifiers, with the view of meeting the bismuthide of calcium difficulties. Then, when he had seen that he could not do so, and the summer went on he had gradually reduced the lime purifiers until now he was working with four oxide and one lime purifier. This ought to be exactly the position Mr. Gandon mentioned, as there were no other means of taking the carbonic acid out of the gas but this one lime purifier. The gas should always drive forward the sulphur compounds in a purifier, but he did not find this to be the case.

Mr. GANDON said that was not the case always. They required a very considerable number of lime purifiers in order to do this. If they trusted to one purifier to remove all the carbonic acid, a portion would pass forward as bismuthide of calcium, and the hydrogen was driven out; they must have three or four lime purifiers.

Mr. GODDARD said this point seemed to him to vitally affect the question. In ordinary works they did not want to use a great number of lime purifiers. The gas was mainly purified with oxide of iron, and only a little lime was used.

Mr. GANDON remarked that he would not use lime at all if he were not under the operation of the sulphur clauses. He did not think anything of carbonic acid in gas, for he did not consider that it did any harm.

Mr. GODDARD said in that case he did not see much use in the process. The gas should always drive forward the sulphur compounds either obliged or chose to use lime.

Mr. WILSON said he had already stated that it was more directly applicable to those companies which were under the sulphur clauses, where they must keep within a certain number of grains of sulphur, which was usually understood to mean bismuthide of carbon, in 100 cubic feet of gas. Where companies were not under the sulphur clauses it was not so absolutely necessary. Where, however, gas managers were obliged to use lime, it was desirable to have a system which could be worked with economy.

Mr. GODDARD said it appeared to him that it must be the desire of every manager to take away the sulphur compounds with as little lime as he possibly could, and therefore if one purifier would answer the purpose he would not use two.

Mr. GANDON said it did not follow, because two purifiers were used, that more lime should be employed, but rather the contrary.

Mr. GODDARD said his last observation was only preparatory to the remark that, considering the size of purifiers compared to the quantity of gas passing through at a time of the year, he found he could get within certain limits between 20 and 23 grains of sulphur in 100 cubic feet of gas

with one lime and four oxide purifiers; but when he took the lime out it was a very bad colour, and smelt very strongly.

Mr. WOOD asked what was Mr. Hislop's result with sulphur compounds other than sulphuretted hydrogen.

Mr. GANDON said the Eastern Gas-Works belonging to the Corporation, they were not under the sulphur clauses legislation; but Mr. Hislop was a chemist, and for his own satisfaction he had analyzed the gas, and the sulphur compounds in it were considerably under 20 grains per 100 feet. The system he proposed was exactly the same as that employed by the London Gas Companies, who were under the sulphur clauses. He converted the lime first into sulphide of calcium, leaving the carbonic acid in the first purifier. Then the sulphide of calcium absorbed the bismuthide, or any other sulphur compounds which could be absorbed in that way. After being in the state of sulphide, it was re-converted into carbonate of lime by the gas being driven into the oxide of iron purifier. The essence of the system was that the lime in the purifiers should be taken out as nearly as could be a carbonate, and the sulphur should be driven into the oxide of iron purifier, where it could be dissolved and made marketable.

Mr. WOOD inquired how many purifiers were used.

Mr. WILSON: Four.

Mr. WOOD asked what was the first.

Mr. WILSON said it was quite immaterial; it might be oxide or lime, but he had them alternately—one lime and one oxide. If the gas went into the oxide purifier first, the same action would take place. It would leave it sulphuretted hydrogen. The first lime purifier would become a carbonate of lime, the third (the oxide purifier) would take the remains of the sulphur, and the fourth lime purifier would become a sulphide from the remains of the sulphur. Then he would throw off the first lime purifier, which was a carbonate purifier, and by the same action would get rid of it. It would leave it out of it into the oxide, and it would become carbonate, and so on. It was really the same as the system adopted by the Gas Referees, only on a small scale. They had four systems of four purifiers; four purifiers would contain lime, four oxide, four lime, and four oxide; one lot being left off to be replaced by the next. Instead of using four purifiers he used one.

Mr. MAY asked what size the purifiers were.

Mr. WILSON said about 30 feet square.

Mr. GANDON thought they were 40 feet by 30 feet.

Mr. MAY inquired what quantity of gas was passed through in 24 hours.

Mr. GANDON said it was about 100,000 feet. It was very essential, in converting lime into carbonate, to employ large purifiers.

Mr. WOOD wished to know what was the longest time he had worked the same lime over and over again.

Mr. WILSON said Mr. Hislop had been working it for three years, doing nothing else. He had now restored his lime about 150 times, would get rid of it in about a week.

Mr. WOOD understood that chemically it was the same as at first.

Mr. WILSON said Dr. Wallace gave the chemical analysis at the hundredth and the seventieth restoration as almost identical. It was not the same as the first. He gave the original time, then the spent time after the first, second, third, fourth, seventh, and the hundredth restoration.

Mr. GODDARD said he supposed he used a little fresh lime now and again in combination.

Mr. WILSON: No.

Mr. GANDON understood Mr. Hislop to say he had mixed fresh lime occasionally.

Mr. WILSON said he might have done so from his stock getting low.

Mr. GANDON said he did not say for what reason, but as a matter of fact he had mixed some with it.

Mr. WILSON said Mr. Hislop told him he had some lime from the soap-works and put it with his lime; he did not say anything about having had fresh lime.

THE SECRETARY understood there was a small amount of spillage.

Mr. ELDRIDGE could not quite understand how the process was conducted. He could see that while No. 1 purifier was used as a sulphide purifier, No. 2 was used as an oxide purifier, and the lime would be all right, and there would be under 20 grains of sulphur; but when that one ceased to take out carbonic acid there must be a time at which the sulphur was increasing, because, as far as he understood, to take the sulphur out they must have a sulphur purifier, and one perfectly free to take out the carbonate.

Mr. BROADBERRY had always understood that by this process there was a remarkable saving in lime, as it could be used over and over again; but it appeared to him that they could do so for the purpose of carbonic acid only. If they were using lime altogether they could use it up to a certain point, and beyond that point they must come to a dead-lock, or pass the sulphur forward.

Mr. WILSON said that was so, but they had then the operation of driving the sulphur out of the lime into an oxide of iron purifier. There were several samples of the lime on the table, and it was quite worth its original price for building purposes. [Mr. Wilson further explained to Mr. Eldridge the reason in which the process was conducted.]

THE PRESIDENT said he understood that when No. 1 purifier became fouled with sulphur, No. 2 was turned on as a first purifier, the gas then passing through Nos. 3 and 4.

Mr. GODDARD said there must be five purifiers, or at some time there would be only three going.

THE PRESIDENT inquired whether, when there were only three in use, there would not be an indication of sulphur at No. 1 purifier.

Mr. WILSON said the fourth only acted as a catch purifier.

Mr. GODDARD supposed the fourth purifier was used as a practicality in use; it was not really used on as soon as No. 1 was turned off.

THE PRESIDENT said if it stopped at the third purifier he could understand it.

Mr. GODDARD did not see how they could work with only four purifiers, as there must be one of some times.

Mr. WILSON said there were always two lime purifiers and one oxide purifier. If they had always two lime purifiers, the first would become carbonate, and the second lime purifier would become sulphide, whilst the middle one—the oxide purifier—would take out the sulphuretted hydrogen.

Mr. ELDRIDGE said he could understand it would remain so for some time, but there must come a time when there was a break.

Mr. WILSON said it was a little puzzling at first, and he found some difficulty in understanding it, but he had ultimately worked it out to his own satisfaction.

Mr. BROADBERRY thought they could not work it up to a perfect carbonate with two oxide purifiers and two of lime. They would require five or six purifiers before they converted it into a perfect carbonate.

Mr. WILSON said they did not require it to be a perfect carbonate. Dr. Wallace's analysis showed that after the first fouling there was 18.91 per cent. of sulphide of calcium.

Mr. BROADBERRY remarked that if they had not a perfect carbonate when they got it into the retort they must drive it off somewhere.

Mr. WILSON said the sulphur then became sulphate, and the hydrogen became water with the air. There was no increase of sulphur fumes in

the chimney. It would have been dangerous to theorize on this matter without facts, but where they had hold of the fact to begin with they could then rise up to it.

Mr. Eldridge remarked that there were no ascension-pipes to any of the retorts.

Mr. Wilson said they were not required—all went up the chimney.

The Secretary said there were openings by which the admission of air was allowed, which allowed the flame to be carried over the lime.

Mr. Wilson further explained, by the aid of a diagram, the operation of the process. The object was, he said, to make the lime as near a carbonate as possible. In the top retort the heat was not enough to burn the lime, because there was such a quantity of vapour in it that so much heat was absorbed that the lime could not get up to the point of expelling the carbonic acid. That was done in the three lower retorts, from whence the carbonic acid was sent through the top retort, and the process went on. It was difficult to explain, unless it was seen in operation, and the theory thoroughly understood by which it could be brought about. In general reply to the observations which had been made, he said he was quite correct, as Mr. Gandon said, that the lime should be as nearly as possible a carbonate; but, as would be seen by the analysis of Dr. Wallace, the first operation on which the restoration was based contained 18 per cent. of sulphide, so that it was not a pure carbonate. The use of large purifiers, on the contrary, was due to the fact that the gas went much more slowly through them, and the material in them was more active than in small purifiers. The action of the top retort was to drive off the sulphur compounds, not the carbonic acid, the heat there not being sufficient for the purpose. The sulphur contained in the spent lime in the top retort was really appeared to be converted into sulphate from the oxygen of the air which passed through the retort from the furnace. As Mr. Chapman had remarked, the lime slaked well, and gave twice its bulk of original lime, or a little more. Mr. Wood's remarks applied to small gas-works where no oxide was used, and on that point Mr. Wilson laid stress. He said that he had no doubt that the lime would accumulate in the successive restorations, and after a time to so large an extent that it would become inert. It must then either be used as building lime, or if they did not adopt oxide in the system of purification, they must adopt it in the system of restoration. They must pass carbonic acid through the lime, and the lime would be converted into lime. Mr. Gandon mentioned that he had four purifiers of oxide and one of lime, and in this way he brought his sulphur down to 234 grains. That was quite possible; but if they were under the sulphur clauses they were required to be even more careful. Mr. Hillop's system took the sulphur out of the gas, and the gas came out of the retort as pure as the lime. The President said he thought Mr. Wilson's paper would be the means of sowing good seed, and the process certainly deserved their most careful consideration. He had himself devoted some little time to the matter, and he saw the view of the subject, but he found it intolerable nuisance, and it was to get rid of spent lime. He at present did not know of any way of carrying it away in barges, as there appeared to be no practical use of it, and he feared that the Thames was generally the sufferer. A great many points of considerable importance had been mooted, and he fully coincided with some of the views which were put forward, but he was not fully concurred with Mr. Gandon. The result of the process by the large purifiers the foul lime was brought into carbonate of lime, which was again capable of taking up sulphur. He had worked four purifiers continuously. He could not say that he fully concurred in the arrangement of purifiers described. If there were three retorts with that concerned under the gas clause, he would not object to it, but if they were carried on to the fourth, and the fourth were lime, sulphur must exist in the gas, indicated by the ordinary tests. He was rather firm on this point, because it had come practically under his attention more than once. Some time ago he was consulted by his father on this matter. In the first place they had six purifiers; Nos. 1, 2, 3, and 4 were oxide, and Nos. 5 and 6 were lime, and through one of these lime purifiers gas always passed; but strange to say there was invariably an indication of sulphur after it passed through the lime. This did not, in his own experience, last very long; but a short time afterwards his father and some alterations made in his purifiers, and he complained of the same thing, his father then tested the sulphur by Dr. Letheby. Up to the time he made this change in the purification, he was characterized as one who supplied the purest gas in London, as far as bisulphide of carbon was concerned; but after the change was made, the gas was reported to have a percentage of any Company of London, simply because he used lime as a purifier. The gas, apparently, was not free from sulphur compounds, and therefore the lime broke up the gas to a greater degree, and took off a certain amount of carbonic acid, which liberated the sulphur in the state of sulphuretted hydrogen. He then induced him to change the purifiers, and pass the gas through oxide after passing it through the final lime purifier; and from that time he had no further trouble. The final oxide became more or less foul in time, but only to a small extent. He could only conclude by saying that they had much to thank Mr. Wilson for, especially in the neighbourhood of London, where they were under the sulphur clauses, and it was worth their while to consider whether the process should not be adopted. Although he himself was not under the sulphur clauses, he found the lime a very serious item, using as he did oxide and lime in one purifier. This might be contrary to scientific principle, but the day, but he found it answer his purpose; taking this precaution, however, he passed the gas through two purifiers, so as to free it entirely from sulphur, and to use the lime in each purifier separated 3 or 4 inches from the oxide. That, again, clearly showed that sulphur-fouled lime was freed from sulphur simply by passing it through a purifier of oxide. The carbonic acid through it, and the lime would again take up sulphur, and the process of adopting Körtig's plan for revivifying the oxide purifiers, and found it highly successful; but there was a great drawback, that there was most intolerable smell from it. That was after he removed his 4 inches of lime, he was as a purifier, and the lime was left to remain. He then found that on passing the vapour, or allowed the oxide, and then passing through the lime at last, it had the strange effect of not only revivifying the oxide, but also of revivifying the lime to a large extent, so much so that the purifier removed both sulphur and carbonic acid to a greater or less extent. The purifier being the fourth, the lime became perfectly white, whereas before it was a dark slate colour, clearly proving that the sulphur had been driven forward by means of the carbonic acid. He would not enter into the chemical theory, but simply give the practical results of his own experience.

Mr. Wood moved the vote of thanks to Mr. Wilson for his able and interesting paper, and also for the patient way in which he had listened to and answered the questions which had been put.

Mr. Broadbent seconded the motion, which having been carried unanimously.

Mr. Wilson observed he had only one word to add to what he had said. The last lime purifier would always be a sulphide of lime purifier. If they studied the matter, they would find it would get them out of the difficulty, because the sulphur compound which would pass the last oxide

purifier would not be sulphuretted hydrogen, but sulphur in other forms, and if the last lime purifier were sulphide it would take up those other compounds.

A vote of thanks was then passed to the President, and the proceedings terminated.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

(Continued from p. 264.)

Mr. YOUNG'S paper was as follows:—

JOTTINGS ON THE PRINCIPLES INVOLVED IN GAS MANUFACTURE.

The success of any manufacture very much depends on the principles upon which it is conducted; or, in other words, upon the correctness of the application of the physical, chemical, and mechanical laws affecting such manufacture. From time to time, I have made jottings of matters which occurred to me relating to the principles involved in gas manufacture; and believing that these jottings might be of some little value to the members of this Association, more particularly as pointing in the direction in which we are likely still further to improve our manufacture by the proper application of those principles to which I refer, I have, with the view of submitting them for your consideration, arranged and strung them together in something like the following order.

Coal, the great staple of our manufacture, is, as you are aware, of vegetable origin, consisting of the elements carbon, hydrogen, oxygen, nitrogen, and the mineral matter of the ash piled up ages ago into complex molecules by the agency of sunshine. Each pound of coal which we take into our retorts represents a fixed and definite amount of the first element in its piled-up molecules, and it altogether depends upon how we allow these molecules to fall or tumble down, what is the amount of that stored-up potential energy which we can utilize to our desired purpose, and prevent from being uselessly dissipated and lost so far as we are concerned.

Heat, chemical affinity, and gravity, are forms of energy or force which are largely drawn upon to reduce from our coal the various substances which we desire. The heat which is required for the wrenching asunder of the highly complex molecules of the coal, and raising them to a still higher temperature, is obtained by the burning of a portion of the coal in the coke with the oxygen of the air, and thus falling back into the state of carbonic acid, the form probably possessed prior to being built up by the sunshine into the plants which form our coal.

The aim of the gas manufacturer is to utilize or transfer the whole of this energy, resulting from the burning of the carbon, in conferring a higher potential energy upon the volatile constituents of the coal; but in practice this desired end is not attainable. First, we have an atmosphere four-fifths of which is nitrogen, an inert gas which requires to be heated before we can obtain a supply of oxygen to combine with our fuel; then we require the products of combustion to be so far left in a heated state as will cause a draught in our furnace; and the volatile distillate also from the coal necessarily passes in a highly heated state from the retort, and that heat we have to dissipate by means of our condensers; and, finally, we have air and the ether surrounding and permeating the walls of our retorts, and all this away heat by conduction to heat the air and the walls.

Many meritorious attempts have nevertheless been made with the view of economizing the heat. There are two distinctive lines upon which efforts have been made to obtain the desired end; the first, by utilizing the heat in such a manner that as much as possible is abstracted from the products of combustion direct to the desired position of the coal, as was—said, I suppose, still is—done in Mr. George Anderson's compound setting of clay and iron retorts, the bad-conducting clay being used when the temperature or heat was very great, and the good-conducting iron retorts after the heat was lower, and before the products of combustion were allowed to pass away into the main flue. The other line consists of what is known as the regenerative system, where the products of combustion, after having passed around the retorts and parted with a portion of the heat, are in their passage to the main flue made to pass through brickwork, which abstracts most of the remaining heat; and this hot brickwork is then employed to heat the air and the volatile distillate, the oxygen to the fuel in the furnace. The latter system of utilizing the heat from the combustion of the coke has been lately receiving a large amount of attention, as you will have seen by the pages of our scientific journals, and, I believe, deservedly so; but I am of opinion that the first system is now capable of further extension, only it must be carried further than it has been—said, I suppose, still is—done in Mr. George Anderson's compound setting of clay and iron retorts used to a comparatively low temperature, and the volatile products subjected to the higher temperature in the more highly-heated retorts—a matter to which I will allude in my next jotting, which is, that it very much depends upon how the heat is communicated to the coal, what are the resulting products. We not only desire the energy of the combustion of the coke stored up in the volatile constituents of the coal, but we are desirous of distributing it in a particular way. We wish as large a yield and a high gas of as high an illuminating power as possible.

At our last year's meeting in Edinburgh I had the pleasure of showing you a variety of gases, all containing exactly the same weight of carbon and hydrogen, and yet all having different volumes and illuminating powers, revealing the strange fact that small volume and small illuminating power may go together. Those differences of character we then saw to be to a large extent due to the differences of the potential energy which was stored up in the volatile constituents of the coal, and we saw that to transmit the heat to our coal so as to bring about the desired result?

There are three means by which the heat can be transmitted to the coal—viz., by direct conduction; by convection of the volatile constituents; and, lastly, by radiation from the walls of the retort. We may state briefly that the heat is transmitted by direct conduction through the coal itself, or by direct contact between heated solids and the volatile products by means of convection, there is an indiscriminate transference of heat to the various constituents of the coal, which are scattered and mixed up in a manner in a manner consistent with our wants, and, on the other hand, when radiant heat acts upon the coal and its volatile products, it has, so to speak, a selective action, breaking up and re-arranging the constituents of the coal more in the manner we desire. To allow the heat of the combustion of the coke to be applied to the coal in a direct form is to allow the heat to be applied to the coal as a free space in the retort, and I have no doubt that this free space should be of certain fixed dimensions.

At the present moment we have many evidences of the correctness of the principle of distilling with a considerable free space in the retort. We also have the advantage of working light charges, and of having the coal regularly distributed in a layer, so as to have the free space and the coal in as regular a layer as possible. Mr. West's mode of charging retorts accomplishes this object in a most admirable manner, and with what ex-

cellent results the pages of the *JOURNAL OF GAS LIGHTING* indicate. We have further evidence also in the fact that every mode of carbonizing where the retorts were completely filled so as to leave no free space, or where the decomposition of the volatile constituents of the coal was effected by contact with incandescent solid matters, have been abandoned.

The great object of the distillation is to be the complete reverse of that of the gas manufacturer, for it is simply to supply as much energy to the solid but volatile constituents of his shale or coal as shall cause them to assume the liquid form, avoiding as far as possible their conversion into gas. He further desires to convert the volatile constituents into the paraffin or methyl group, and our experiments last year we saw that of the mixtures of gas containing the same weights of carbon and hydrogen, the methyl group possessed the least potential energy of all. Now the experience of the oil distiller is, that to obtain the best results from his coal or shale, he must have his retorts completely filled, for if he leaves a free space, he gets his higher paraffins broken up into a corresponding quantity of olefines, as also more gas than he desires; and therefore, in that manufacture, retorts in which the charge leaves no free space are invariably employed.

Is it not possible—nay, probable—that a combination of the oil retort with a free space retort may be the best mode of bringing out the object we desire? The old retort is more properly speaking, the volatilizing retort, could be large in dimensions, charged by simple gravitation, and heated with the spent heat, so to speak, from the retorts, when the volatile constituents would be decomposed by means of radiant heat. I think so; at least it is worth a trial by those who have the time and the facilities at their disposal.

The products resulting from the carbonization of the coal, as they leave the arrangement, are of a very complex character, and their separation and retortment, in the apparatus, by the various principles of physics, Chemistry, and Chemistry. Time will allow me to notice only a few of these, and that in a very cursory manner.

The products, as they reach the hydraulic main, are so far cooled that most of the denser tars have assumed the liquid form, and have more or less entangled the sooty matters, and a considerable amount of the shale is also in the liquid state, and the hydraulic main, but there is also a very large quantity of tar which, although liquefied, is in such a finely divided state that it keeps floating forward with the gas. Now it is most desirable, for reasons which are familiar to you, to get quit of these finely dispersed tarry particles, and my next jotting refers to this subject.

My next aim is the analyzing process of Mr. Aitken, and of the means there employed for separating the tarry particles. So long as the dimensions of the analyzer bear a proportion to the make of gas, it accomplishes its object most perfectly; but where the quantity of gas passing is great in proportion to the size of the arrangement, those tars in a finely-divided state, and their weight, throughout the whole of the apparatus, is great, where gas was used to wash out the oil vapours in the destructive distillation of shale, the writer also experienced the difficulty of getting the finely-divided oily matter precipitated, which led to an investigation on the subject. The experiments were made by filling two large glass bottles with the gas, and the finely-divided particles of oily matter, the one being kept heated to a temperature of about 150° Fahr., and the other cooled to about 40°. The oil in the large bottle, kept warm, was precipitated in a few minutes, and the gas became quite transparent. On the other hand, the gas in the cooled bottle remained quite foggy for at least half an hour, and even the gross oily particles were precipitated very slowly. This is a simple experiment, and I would advise members to try it for themselves, as it is most instructive.

There are two reasons why the heating of the gases should lead to the precipitation of the tarry or oily particles. First, the enormous dilatation of the gas when heated, compared with the expansion of the tar particles, causes the latter to have a much higher specific gravity, and, consequently, to fall more freely through the diluted gas; and, secondly, a more rapid coalescence of the tar particles, due to the more rapid molecular motion of the gases, and also to the fact that water vapour would not be so much extended in the warmer gas, and the tar particles are freed from moisture, and, therefore, more liable to cohere and entangle each other. The gas containing the finely-divided particles was next passed through a long glass tube. When the tube was placed vertically, and the gas passed either up or down through the tube, a very slight precipitation took place, and the finely-divided particles were slowly removed from the gas, and the gas of the pipe quite foggy. When the pipe was laid horizontally, and the gas passed quickly through, a like result occurred; but when passed somewhat slowly, and the tube kept slightly warm, the particles were almost entirely precipitated on the bottom of the tube.

Applying the facts to our case, we can easily see why a vertical pipe condenser can never be a good one, because it is quite evident that when the current of gas is passing upward it is constantly meeting the finely-divided particles of tar, the current buoying them up, and acting against the force of gravity, and tending to keep these particles in suspension. On the other hand, on the direction of the current being changed, and the gas passing downward, both the force of gravity and the current of gas are tending to keep the tar particles in suspension, as the gas travels faster than the particles, which would naturally sink through such gas, and, therefore, the only precipitation likely to take place would be on the side of the pipe, and at the bottom, where the gas is slowest, and leading to repeated contacts of the gas with the side of the pipe. The facts also point to the advantage, so far as mere precipitation is concerned, to be derived from a pipe carried round the retort-house horizontally, and are arguments in favour of our horizontal condensers, but only so to a limited extent, for horizontal pipes, as in the present arrangement, as a retort-house, at present arranged, causes the gas to travel at such a velocity that the force of gravity upon the particles of tarry matter is to a large extent nullified, just as the force of gravity on the mud in a stream is nullified by the force of the current of water.

My next mode of rid of the tarry matter from one of our Border towns stated at one of our meetings that he used a device for the removal of the tar which he called, if I remember rightly, an expansion-chest. There is no doubt that in a large chamber such as he described, where the gases were comparatively at rest, the tar particles would to some extent settle out by gravitation, but it would be no longer the case, if they would, if we consider that in a large vessel the tar particles in the upper layer of gas would have to fall through the whole depth before final precipitation, it would require a very large vessel indeed to allow time for the whole to be precipitated.

The writer naturally suggested itself that if a large chamber was divided by a series of shelves, so arranged as to leave ample room at each end for the distribution and collection of the gases where they enter and leave the chamber, the tarry particles would then only have to fall through the gases the distances between the shelves, and as the shelves would have a cooling effect, they would be no longer the case, if they would, if we consider that in a large vessel the tar particles in the upper layer of gas would have to fall through the whole depth before final precipitation, it would require a very large vessel indeed to allow time for the whole to be precipitated.

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having them kept heated up to such a temperature as to prevent the injurious action of the tar during the period of precipitation, and to have a series of them, so as to properly fractionate the denser from the more volatile hydrocarbons, and leave the volatile hydrocarbons in the gas. With that object in view the shelves should be laid at such an incline as to allow the gas to pass over the shelves in a regular manner, and to have a series of them, so as to prevent the exposure to a temperature as low as that at which they were precipitated.

The sooty tars and tars proper having been precipitated and fractionated from the gas, it is now ready to undergo chemical treatment for the elimination of the alkaline and acid compounds. Water is our great purifying agent. It absorbs ammonia, and by its agency every trace of that alkali can be easily eliminated. It also absorbs the acid gases CO₂ and H₂S, and by its solvent property for those gases they are combined with the lime or other purifying agents employed to chemically combine them. There is, however, a certain class of impurities which are not solvent in water, and are with difficulty removed from the gas. These compounds, as I showed you last year, are, however, soluble in the hydrocarbon fluid recovered from the waste gases in oil manufacture, and by its instrumentality can be easily removed from the gas.

Before proceeding, however, to describe an arrangement for carrying out the principle of liquid purification by means of water and hydrocarbon fluid, I would like, with your permission, to show you a few experiments illustrative of the effect of the state or condition of matter in influencing the physical and chemical affinity existing between them.

I have here a long vertical tube filled with a mixture of solid crystalline naphthalene and sawdust, the object of the presence of the latter being merely to keep the naphthalene open, and allow the gas to pass freely through the solid naphthalene. I will now pass the gas supplied to this room. You will observe that the gas, when it enters, is of like size, that the gas passes through the naphthalene without suffering any deterioration; or, in other words, the naphthalene, whilst in the solid state, appears to have no solvent power for the gaseous hydrocarbons diffused through the gas. I will now pour into the tube containing the naphthalene and sawdust a little tar oil which has been separated from naphthalene. You will observe that the illuminating power of the gas is at once reduced, showing that the oil has a solvent action upon the gaseous hydrocarbons in the gas. I have here a second like tube containing sawdust and sulphur, through which I propose passing a stream of gas saturated with vapour of bisulphide of carbon. I accomplish that object by passing the gas supplied to this room through a Woolf's bottle containing a small quantity of liquid bisulphide of carbon. You will observe that the gas, after passing through the bottle, has lost its illuminating power, partly due to the pressure of the sulphide of carbon vapour, but also in part due to the fact that the volatile sulphide of carbon has so strong an affinity for the gaseous hydrocarbons that it has a powerful solvent action upon them.

I will now pass this gaseous mixture of sulphide of carbon up through this layer of sulphur and sawdust, about 18 inches deep. You see that no change has taken place in the illuminating power of the gas, and on placing the nose over the burning gas, it is found, from the insufferable smell, that there is no change in the illuminating power of the gas. I will now pour down through the sawdust and sulphide a small quantity of this hydrocarbon fluid recovered from the waste shale gases. You see that at once the illuminating power of the gas is vastly improved, and so far as small can detect, there is not a trace of sulphide, and the most delicate method of test would show that the gas is pure. This is not deceiving, for by the application of the fluid every trace of sulphide of carbon can be removed from the gas.

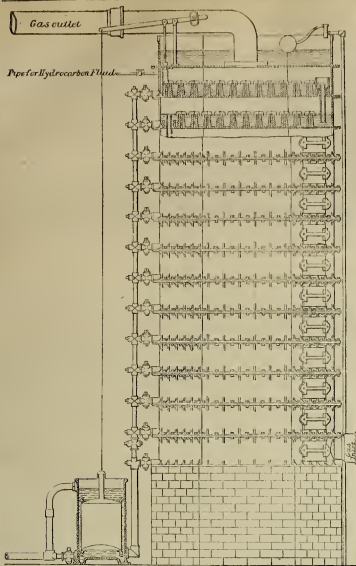
I will repeat the experiment in another form by employing those four Woolf's bottles through which to pass the sulphuretted gas in place of the long tube containing sawdust and sulphur. You will again observe, on testing, that although the gas enters the first bottle smelling most strongly of sulphide of carbon, not a trace of it can be detected at the outlet of the fourth bottle, and that at the same time the gas has been vastly improved in illuminating power.

Now I will show you another tube containing sulpho-hydrate of calcium (CaSH₂), through which I pass a current of the sulphuretted gas. Now we know that this compound of lime does combine with bisulphide of carbon to form sulpho-carbonate of calcium (CaSC₂), yet you can find by the smell of the burning gas which has passed through it, that the action is very slight, and indeed, so slight that it is hardly perceptible. I will now pass with this hydrocarbon fluid the surface of the lime compound, you again see that the illuminating power of the gas is improved, and at the same time the bisulphide of carbon is wholly removed, the gas not having a trace of the smell of sulphurous acid.

Now I will suggest to myself—Why is it that the solid crystalline naphthalene and the solid crystalline sulphur, as also the solid sulpho-hydrate of calcium, have no solvent action upon the vapours, or are not dissolved by the vapour of the liquid which is an excellent solvent of those solids when they are in the liquid state, or readily combine chemically with the latter? The only explanation which has suggested itself to me is, that the molecules of the naphthalene, sulphur, and lime compounds, when in the crystalline state, are so locked up, or their motion so far altered or stilled, that they are incapable of synchronizing with the molecular motions of the solvent in the gaseous form, and therefore incapable of entering into motion, and so unable to combine with the vapour. I will now allow the gas to enter into union with the lime, that, on the other hand, the molecules of the solvent in the liquid state can synchronize, and therefore can shake down the crystalline mass into the liquid condition, and also enter into combination with the lime compound.

What is the right or a satisfactory correctness of the assumption, the facts which I have just stated are capable of explaining a variety of phenomena which have hitherto seemed rather puzzling; for instance, it shows why naphthalene, when once it has assumed the crystalline condition in the mains, cannot be dissolved out with purely gaseous hydrocarbons, and that the only way to get rid of it is by the use of a liquid which is capable of being directly applied. It also explains why the sulphur eliminated from the gas by oxide of iron, although quite soluble in liquid sulphide of carbon, does not remove that substance when in the gas in the form of vapour. It further points to the reason why dry lime does not purify gas, or neutralize CO₂ and H₂S, and why water causes the union. The acid gaseous molecules not synchronizing with the lime molecules, union cannot take place, but the gas molecules and water having a certain amount of harmony of motion, are stilled or entangled till they assume the liquid condition, and being thus brought into harmony with the lime molecules, they are readily removed from the gas.

With the facts gleaned from these experiments, I will now explain to you the action of this scrubber-washer for the simultaneous removal of ammonia and sulphur compounds, as also for scrubbing the gas. You will observe that the arrangement consists of a series of trays or perforated sheets placed over each other, and that each of the tubes forming the perforations is provided with a cap or cover, which is struck from this lined sheet-iron. Each cap is kept in its position by a wire fixed to the centre and passing through the whole depth of the tubular perforation. You will further observe that the tubes forming the passage of the liquors from



COMBINED SCRUBBER, WASHER, AND CARBURETTOR.

For the simultaneous removal of Ammonia and Bisulphide of Carbon, and other Sulphur Compounds, from Coal Gas; and for Carburetting or Enhancing the Illuminating Power by means of Volatile Fluid Hydrocarbons.

tray to tray are alternately provided with an annular casing or cover which has the effect, when two liquors of different gravities, not miscible with each other, are simultaneously employed, of keeping each alternate tray filled with the liquor having respectively the heaviest and the lowest specific gravities. At the top of the arrangement is placed a cistern for containing the supply of water, which is admitted by the valve in quantities sufficient to make an ammoniacal liquor of any desired strength by means of the regulating arrangement placed at the one side, which is substantially a large hydrometer which actuates the valve. The hydrocarbon fluid recovered from the waste shale gases or from petroleum, for the removal of sulphide of carbon and other compounds, is introduced either by means of a pump or by gravitation from a tank placed at any convenient situation, by the pipe entering the one side of the top chamber or compartment. The range cocks on the side is for transferring the whole contents of any one chamber into any other lower chamber, or for allowing it to flow away to the receptacle for saturated liquors.

The various compartments being charged with water and hydrocarbon fluid, the gas is passed into the bottom compartment, and finds its way up through the tubular perforations and under the caps or covers. Those caps are lifted till the remaining layer of liquid is equal to the weight of the cap, which, in those hitherto employed by the writer, equals something less than one-eighth of an inch. The gas then bubbles through the liquid, say water, parting with a portion of its ammonia. As the wires retaining the caps in position are quite loose in the tubular perforations, the caps keep oscillating and dancing about, floating as it were on the surface of the water, causing a considerable commotion, and consequent contact between the gas and the water, enabling the latter to do its work most effectively. The dancing about of the wires in the perforated tubes keeps them quite clean free from all foreign matter. The gases, partially deprived of their ammonia, then pass through the tubular perforations of the next compartment, and behave in a similar way under the caps; but this compartment containing a hydrocarbon fluid absorbs the bisulphide of carbon and the other compounds. It also absorbs ammonia, for you will remember that last year I not only showed that this fluid had the property of absorbing sulphur compounds, but also ammonia. At the same time that the gas is deprived of a part of its sulphur compounds, it takes up in diffusion a part of the vapours of the hydrocarbon fluid, and thereby becomes of higher illuminating power. The quantity of vapour so taken up can be regulated to what is desired in two ways—either by slightly altering the temperature, or by employing a hydrocarbon fluid of different density. At each successive tray the gas is alternately subjected to the action of water and hydrocarbon fluid as described, becoming freer and freer from ammonia and sulphur compounds, and at the same time improved in illuminating power, till before reaching the upper tray it is free both from ammonia and from the sulphur compounds soluble in the hydrocarbon fluids, which are just those which we have hitherto experienced the greatest difficulty in removing by the agency of chemicals and water.

We now come to treat of the automatic mode of supplying the water to make an ammoniacal liquor of a given specific gravity. The valve in the water-tank on the top, actuated by the lever connected to the hydrometer arrangement, is purposely left with a groove under its side, to allow a stream of water, much smaller than that needed to treat the gas, but sufficient to keep the hydrometer constantly in action. The water passes through the whole of the chambers, and flows from the bottom compart-

ment into the vessel containing the float or hydrometer. This float is allowed by filling with water and a little shot till its specific gravity is exactly equal to the specific gravity of the ammoniacal liquor desired. It is evident, should the liquor become of greater gravity than required, the float will at once rise, lifting the valve at the top, which will allow water to flow through the arrangement till the specific gravity of the liquid in the vessel containing the float is brought to exactly balance it. Should an increase of gas increase the strength of the liquor, the float will rise and let in more water, and *vice versa*, should the make of gas fall off, and the liquor weaken, the float will sink, shutting off a part of the supply. The hydrocarbon fluid, of course, is, for evident reasons, not capable of regulation in this manner, and must be added as from time to time the testing of the gas shows it is required. It must also from time to time, as it becomes saturated with sulphur compounds, be run off from the lower trays in the arrangement, and treated for their removal, either chemically by the sulpho-hydrate of the alkalis or other agents, or separated by fractional distillation.

Of course, the principle of this arrangement may be variously applied, and if time would permit I should like to allude to them. However, I believe that this part of my subject will be taken up at some of our future meetings by other members of this Association, at whose hands I am satisfied that it will receive ample justice. In the meantime, I hope I have said sufficient to show that sulphur compounds, such as bisulphide of carbon, can be easily removed by means of this fluid, and without the agency of lime; and I am also satisfied that a trial on the large scale would show, more particularly when canal coal has to be carried considerable distances, the gas could be carburetted or enriched much more cheaply than by that material. In such a case, however, it would perhaps be more convenient to employ the hydrocarbon fluid, and remove the sulphur compounds after purification, when hydramid oxide of iron may be the sole agent employed to remove sulphuretted hydrogen, and employ the hydrocarbon either alone or in conjunction with a solution of the alkaline sulpho-hydrate of soda or potash.

I have a number of other jottings, but the paper has already assumed such a length that I will only dare to refer to one other—namely, the principles involved in the measurement of the volume of gas, and the corrections to be made for temperature and pressure.

Our meters are most ingeniously constructed instruments, and with the most recent improvements give the exact measurement of gases at the temperatures and barometrical pressures at which the gas is passed through them; but, as you are aware, gases are subjected to great changes of volume from changes of atmospheric pressure, temperature of the air, and diffusion of water vapour. You observe that the device consists of a yield of gas from any given coal, and its illuminating power, it was necessary to fix some standard point of measurement. In this country that standard, as you are aware, is fixed at 30 inches of the barometer, and 62° temperature. In the writer's scale, however, the standard temperature is greater or smaller than those, those corrections have to be made in order to ascertain the exact volume.

A very interesting paper was recently read before the West of Scotland Association of Gas Managers on a simplification of the usual mode of calculating out the corrections, and the writer, I am sure, has done his best, has also been some valuable correspondence on the same subject. I think, however, that the whole may be very much simplified by this little apparatus, which is based upon the principle of making a volume of air or gas register directly, by means of a column of water, the changes of volume due to changes of atmospheric pressure, temperature of the air, and diffusion of water vapour. You observe that the device consists of a flask containing a little coloured water, into which is made to dip a glass tube passing through and sealed in the neck of the flask. Attached to the tube is a scale showing the percentage in units and decimals of the changes visible to the naked eye. Changes of atmospheric pressure, temperature of the air, and diffusion of water vapour, as you are aware, cause a rise or fall in the level of the water in the tube. You observe that the moment I lay my hand upon the flask containing the gas, the dilatation or expansion due to the slight increase of temperature is at once made visible by the rising of the column of water in the glass tube, and that on removing my hand the column at once sinks. Changes of atmospheric pressure, and temperature of the air, for the end of the tube being open, changes of pressure from the atmosphere at once raise or lower the column of water in the tube. Those changes can be at once read off in percentages, and the corrections for temperature, atmospheric pressure, and state of hydration at once made by adding or deducting the percentages shown upon the scale. This little device thus supplies not only the place of a barometer and thermometer, and table of volume of water vapour in diffusion, but it also gives the exact percentage number due to them all, thus saving a considerable amount both of labour and expense for apparatus.

I think, however, that this principle might with advantage be carried still further, and applied to the meter itself, so as to make it register under all conditions the correct standard quality of gas passed. I do not at least see any reason why it should not be applied to station-meters and experimental meters for the testing of illuminating power, &c., and this could be accomplished in a variety of ways. I throw out the following hints to the meter-makers.—Suppose, for instance, a device similar to an aneroid barometer, only instead of having a perfect vacuum at the back of the disc, the disc chamber was filled with gas and a little water enclosed along with it; it is evident that as the gas inside the chamber increased or decreased in volume by changes of temperature, pressure, &c., the water would rise or fall, and the disc would move inward, and that with considerable force. Now if such a device were attached to the drum-spindle in such a manner that it could lift it when the disc was pushed out, and lower it as the disc was pulled in, and that in a rational proportion to the expansion and contraction of the gas, such a meter would, under all circumstances, register the standard volume of gas. Or instead of a disc arrangement, a vessel containing gas, and sealed by means of a water-lute, in which was placed a float connected to the drum-spindle, when the gas was expanded the water would be raised, raising the spindle, and consequently the drum of the meter; and *vice versa*, when the gas contracted the float would be lowered, causing the drum to sink, and register a proportionate volume of gas.

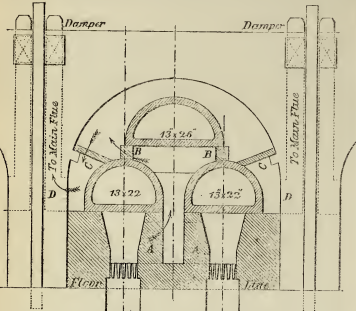
And now, gentlemen, permit me, in conclusion, again to express my regret for intruding upon so much of your time with this paper. When I commenced to run out these jottings, I had no intention of inflicting upon you such a lengthy document; but as I proceeded, the subjects grew upon me; and even as it is, I have given you merely the rough outlines (for the time at my disposal would afford no more) of a few points of my mind notes I have collected, and I am sure that at least I may hope to have the pleasure of submitting to your consideration on some future occasion.

After the reading of Mr. M'Gleish's paper on "Retorts and Retort-Settings," the following discussion took place:—

Mr. WATSON (Stirling) said he put five retorts—18 by 15 in.—in the space of 6 feet.

Mr. FLEMING (Aberdeen) said that during his experience in connection with gas-works he had tried a great number of the different systems of

setting retorts. He had had them in three, with one or two furnaces; in five, with one or two furnaces; and in six, with two furnaces. The retorts, D-shaped, had generally been 9 feet long, and 22 in. by 13 in., or 25 in. by 13 in. After much experimenting and observation he had come to the conclusion that where there was plenty of room to extend the retort-house, there was no system to equal the setting of three with two furnaces, the two lower retorts about 22 in. by 13 in. and the top retort 25 in. or 26 in. by 13 in., so that they could carbonize usually in three hours—he did not go in for four-hour charges—5 cwt. of coals. If during the winter months there should be a heavy demand for gas, with a setting of this description 8 cwt. of coal in 24 hours could be worked quite satisfactorily. Half of the works were ovens of five retorts, and the other half ovens of three retorts, but he would be in favour of having them all in settings of three, with two furnaces, and the retorts set right above the furnaces.



RETORT SETTING ADVOCATED BY MR. ALEX. SMITH, OF ABERDEEN.

Note.—The heat passes from the furnaces along the bottom of the lower retorts, and ascends at the back end through the ports A (14 in. by 9 in.) to the bottom of the top retort, and returns to the front, where it divides at ports B (5 in. by 14 in.), passing along the sides of the top retort, descending at ports C at back end, 6 1/2 in. by 12 in., returning to the front along the sides of the lower retorts, and leaves for the main flue at D D.

MR. WHIMSTER could not say he was satisfied with the Perth settings; nor could he say that he had ever been able to satisfy himself with any setting of retorts. He had tried five retorts with one fire, and two retorts with a wider arch, and consequently there was more space to heat. He had tried it that way, but it was not productive of economy in the retort-house. He had been looking at regenerative furnaces as, perhaps, a cure for all evils in this direction; but he did not see as yet that he could change to any other mode of setting. He could with three-hour charges get 8000 cubic feet of gas per day out of each retort when new, to come down to perhaps 7000 feet, and he had found that before the retorts were worn. He thought the length of the retort mentioned in the paper—9 feet—too long. He had come down to 7 ft. 6 in. in length of clay, not including the mouthpiece, and found that, with oval retorts below 22 in. by 13 in., and with D-retorts above 27 in. by 12 in., he obtained the result stated, and he managed to keep his retorts pretty clear of carbon by scraping after every charge for the first eight or ten days, and afterwards, perhaps, once a week. He added that his retorts were oblong below and D-shaped above.

MR. MITCHELL said that at Dundee last year they effected a saving of 30 per cent. in fuel by setting five retorts to one furnace, as compared with three retorts to one furnace. The remarks made in the paper in reference to Dundee were based on what was called an experimental oven, in which, two or three years ago, they built five retorts to one furnace. Last year they built one section of a retort-bench of twelve ovens, and this year they had built another section of twelve ovens of five retorts each. Those built did not, on the whole, work satisfactorily last winter. The space taken up was 8 ft. 6 in., inside measurement. They had two lower oblong retorts and two above, 21 in. by 13 in. Then the top retort was a D-retort 25 in. by 13 in. inside. The four retorts were 8 ft. 6 in. in length—8 ft. 5 in. inside—and the top retort 9 ft. over all. The consumption of fuel in this oven of five retorts during last winter was two-fifths of the coke produced, or 40 per cent. of the coke made. In their settings of three retorts and one furnace, about 66 per cent. was used. Generally speaking, it required the coke made by two retorts to fire the three. At Dundee the fuel account was not considered to be of greater importance than gas—as gas was understood to be a great point at which to aim. He admired the setting of four retorts shown by Mr. McGilchrist, which carbonized exactly the same quantity of coal in four retorts as he (Mr. Mitchell) used with five. Then in charging and drawing the fire, they were told that one man had to fire the two furnaces in the two ovens, and had charge of the drawing of the eight retorts. In Dundee they worked their retorts in sets of 30, or six ovens. They put one man on to fire the six furnaces, and he did nothing else. Two men did the charging and drawing, and there was a coal wheeler. That was 7 retorts for each man. With Mr. McGilchrist's setting he had a man to do eight. He (Mr. Mitchell) would like to see sixes tried, with one furnace, and he did not think there would be any great difficulty in working such a setting. The only difficulty would be that the arch would require to be flatter, and it would take away some of the strength, but it was worth trying. Ovens of three retorts and two furnaces were at one time largely used in Dundee. Some years back they had two benches—about 80 retorts—set in that manner. One of these benches they had rebuilt, and they also now had a setting of five.

MR. WHITE (Seaborn Harbour) was inclined to dispute the statement that round retorts would not carbonize so well as D-shaped ones. He used round retorts, and was getting more gas than other people in his

neighbourhood; but he did not care so much as to the quantity of fuel used as for a good sample of gas, 4 cubic feet of gas, or small coal, he was able to get on an average 10,000 feet of gas per ton.

MR. MCGILCHRIST, replying to some of the statements that had been made, said, in regard to Mr. Watson's remark about the 6 ft. 6 in. wide arch, that there were three tiers of retorts in his setting of five. He objected to the suggestion because it must strain a man to work it. The whole tendency of the paper was to show that it was unnecessary to waste fuel, to have two furnaces to one oven when one furnace would do the work.

MR. SMITH: You use no more fuel with two furnaces.

MR. MITCHELL was not prepared to admit that there was no more fuel used, but it was a grand mistake to suppose that a double amount of fuel was required. There was, however, a waste of labour.

MR. SMITH could assure the meeting that the furnaces were 9 inches wide for these three retorts, and that they actually used less fuel with two furnaces than they would do with one 14-inch furnace.

MR. MCGILCHRIST thought that 14 inches might be too wide. In regard to the two furnaces he explained that with two furnaces heating three retorts there was an actual loss of 30 per cent. of fuel, and this percentage entirely agreed with what Mr. Mitchell found in the working of the benches at Dundee.

MR. SMITH said this might be owing to the arrangement of the flues.

[The discussion was then adjourned till next day.]

FRIDAY, JULY 9.

The discussion on Mr. McGilchrist's paper was resumed to-day.

The PRESIDENT, in opening the proceedings, said this was a subject on which he could not speak practically, because he had never been accustomed to working such large retorts as had been referred to; but he would like if those having experience in the working of a large number of retorts would state their experience.

MR. SMITH thought that, as practical men, all present should give their opinions candidly on the subject under discussion. Strangers, he said, coming into gas-works, saw different shaped retorts, and ovens of five, and three, and perhaps two retorts, and they expressed astonishment at this variety. Surely one plan must be better than the others. After trying a number of experiments with different qualities of coal, and after he came to the conclusion that if there was sufficient room to put down the requisite number of beds, he would by all means have them in beds of three, with three-hour charges, and then if a sudden demand for gas should arise during the winter time, the retorts could be drawn in 2 1/2 hours. There was no reason why the retorts should be set wider and yet have the coal thoroughly carbonized. He thought the proper size for a D-retort was 32 in. by 13 in.; but 26 in. by 13 in. would carbonize, in three hours, 5 cwt. of coal.

MR. WHIMSTER said his opinion, formed from experience, coincided generally with Mr. Smith's. He was in favour of three retorts in a bed, and with one or two fires, according to the amount of fuel used. He had tried five retorts in a bed, with one fire; but found the difficulty to which Mr. McGilchrist referred, of the top being too high for charging. To get over this difficulty he put the lower retorts down by the side of the furnace, and in doing so had often drawn the top retort out, or get a barrow made specially to go under the mouthpieces. His great objection to fires with one fire was the enormous wear and tear—they could not be worked safely for six months. The upper three retorts had to be taken out, and replaced certainly within about six months. In Mr. McGilchrist's setting of four retorts in one bed there was considerable space lost, just at the crown of the arch, and by having a large furnace between the two, so that although there were four retorts to one fire, it did not matter so much, seeing there was a loss in width, or retort-house room. It seemed to him that between the large and the small fire, the difference just came to a question of wear and tear. With a large furnace, the furnace walls were burnt up in a short time, and, of course, although the retorts were good enough, they must go too. With a small fire the retorts lasted longer.

MR. MACPHERSON said he had had some experience of round retorts, and found that they could be worked efficiently. He knew the objection urged to round retorts was the thick layer of coal in the crown. Still it should be remembered that the round retort had a large surface area, and was a radiant heat from the space above. Of course it had a tendency to deteriorate the quality of the gas; nevertheless, if round retorts were not overcharged, they would give good results. Like Mr. Whimster, he had tried two large retorts in a single arch—a common setting in the West of Scotland. So long as the crown of the arch was not too high, and as they set them down the side and along the flues at the bottom. By this system a splendid heat was obtained, but it had the great drawback that the flues under the retort were easier choked, and a great deal of extra trouble and annoyance were given by removing the flue covers for cleaning purposes. These D-retorts and one fire to the oven was, he thought, about as good and as practical an arrangement as could be had. However, every town must consider its own case separately, as a setting that might be suitable for one place would prove unsuitable for another.

MR. S. DALZIEL (Kilmarnock) said when he went to his present works there were two retorts in each arch, and the arches were very flat. The result was that they came in the crown. Afterwards he put three in for a time. Soon, however, the top one came down, and he ceased working that system altogether. He then rebuilt the whole of his ovens, and made the crown semicircular and strong, and put in four retorts with one fire. He had since been greatly improving his system by working four retorts in a single arch, and he sold them for the last 14 years. He believed D-retorts were the best, but oval or round ones worked almost equally well. He also thought there was something in the shape of the oven. The draught should not be too strong, or upon any particular side; the oven should be so arranged that the heat might be equally diffused.

MR. MACPHERSON said in his paper Mr. McGilchrist asked a question in regard to the closing of the damper during the time of clinkering. His (Mr. Macpherson's) ovens were set with sliding dampers connected to each oven, and these were lowered every time the fire was down. He thought the dampers would be carefully lowered, but if away they were not so carefully managed, for the simple reason that when the damper was closed the heat came out from the furnace upon the feet and legs of the men, and annoyed them considerably. At the same time, if quickly done, it was a great saving of heat. Unless, however, there was a strict foreman, or the manager was on the spot himself when clinkering, the men would not use the apparatus properly. Another thing which had been referred to was the unnecessary height at which retorts were set. He had seen a bunch of retorts so set that the men had to stand on the table of the charge bar, which was downright nonsense.

MR. W. SMITH (Helenburgh) thought a great deal of the setting shown by Mr. McGilchrist, the heat of which was first class. The only objection he had to the setting was that the damper was so near the front of the arch that it was apt to cool the retorts, and the damper was so close to the flue that it was apt to be choked. He thought it would be a good idea, a better heat could be maintained in the front part. For himself, he pre-

ferred three to four or five retorts, as with a little neglect the heat was more readily lost in the larger settings. Besides two ovens of three were fair work for one man; and there was not any great saving in having four or five in the bench.

Mr. MACKENZIE (Dumfrieshire) said that in his time he had worked round, Val, and D-shed retorts, and had come to use nothing new except D's, as he thought they were the most profitable. His ovens were not 15 ft. long, but were 15 ft. 8 in. long, with 7 ft. 7 in. of heating surface. The lower retorts were 20 in. by 15 in., and the upper 22 in. by 16 in., set in a bed of thrice with one furnace. This arrangement had worked very well for the last ten or twelve years. This year he was trying a setting of five, but was afraid to risk such a setting with one furnace. He did not think it possible, with the kind of coke he obtained from Scotch canal coal, to get sufficient heat from one furnace.

get sufficient heat from one furnace. He had seen that the new glow saw the question of fuel was one of great importance, deservng the consideration of every gas manager. He had often wondered to see what he thought a considerable amount of space compared with the heating surface necessary, and it had frequently occurred to him that by this arrangement a large amount of fuel was wasted. This feeling had taken possession of him to such an extent that he had noticed a principle recently introduced in connection with the heating of boilers, some modification of which might be applied to the heating of retorts. It was his own model of the apparatus he prepared brought forward for this meeting, but it was impossible to have it made in time.⁶

Mr. ESPLIN said he had retorts similar to some which had been described. He had benches of fours in his retort-house, but instead of throwing the heat over the retorts he put it under them, carrying it forward, and back again. The main flue was at the back end of the bench. He tried this last winter, and it seemed to heat up to any extent.

Mr. TERRACE said in the setting shown, it appeared that the heat traversed almost in a direct line—not always direct across, as it ascended all the time to the top of the bench, and went thence to the chimney. Did it, he asked, descend at any point?

Mr. M'GILCHRIST said it went from the furnace downwards, passed under the bottom retorts, along the sides, and thence along the crown of the top retorts.

Mr. TERRACE said to utilize the heat properly it should be taken away at the very lowest point possible, and in order to attain this result he did away with the flue on the top, and put underground flues. He constructed two openings in the floor of each oven, and put a damper on these openings, leading the heat down to the flue in front of the bench, and this arrangement, he found, worked very well. He put the dampers in the door and the damper on the side, instead of heat in the oven rather than allow it to escape to the chimney, because in the latter case the full value of the fuel was not obtained.

Mr. Scott (Massachusetts), in answer to Mr. Chandler's desire that he should give his opinion upon the vertical retort, said he had these retorts, but had to work them himself. The men rebelled against working them, and therefore it was no use carrying on the operation. With this retort, however, owing to its construction, and the way in which it ought to be charged, it was capable of giving a continuous mass of gas. The retort was charged from the top, and the coal gradually found its way to the bottom. The men were taken from the top, and the gas came off. The only matter in a certain sense that was left before the gas came off. The only matter was all carbonized. Thus more gas was made out of a certain quantity of coal with the vertical retort than with any retort he had ever seen.

Mr. SMITH asked what quantity of coal Mr. M'Gilchrist worked in the four hours.

Mr. Mc'GILCHRIST said he used 2½ cwt. when the charge was three hours, and fully 2½ cwt. with four-hour charges. In reply to the general discussion, he said Mr. Mitchell had objected that it was far too much labour for a stoker to work a furnace, and that the heat was not so good as in the furnaces connected therewith; but the height of the retorts which he advocated was so much more convenient for men to work, that he would think nothing of it if they were to be put to three or four retorts more. In fact, he knew that in some works in Scotland stokers did more work than had been reckoned on. He held that when there were three tiers of retorts, the setting of the furnace was not so good as in the case of the low to be conveniently worked. He maintained that a setting of four retorts could be heated more economically than three retorts of any size with either one or two furnaces, because, when the fuel was divided into small portions, supposing the same units of heat were produced, they were more readily consumed. He also maintained that the greater the surface of combustion. Mr. Smith recommended two furnaces and three retorts, but in doing so he seemed to have left out of view altogether what he (Mr. Mc'Gilchrist) tried to bring forward as plainly as he could—that the clinkering necessary, which more than one had attempted to remedy, was a serious defect in the retort-settings. He said the furnace doors were opened the cold air rushed in. Mr. Smith seemed to argue that a double the amount of cold air rushed in where there were two furnaces than where only one was used; and that a double amount of labour was requisite to work them. This all went to increase the cost of the gas. In regard to his setting of four retorts, Mr. Whimster said that it seemed to him that the way was to get a setting of four retorts and two furnaces, which was just the principal advantage he claimed—it was because there was an absence of unnecessary space that he had introduced the setting to the notice of the meeting. He might state that between the retorts and the side of the walls there were only 5 inches of flue, and anything less than that would be a disadvantage. He said that the objection to the setting in regard to the space on the top of the retorts, the reason why he allowed it was simply because the heat had its work done when it reached that point. As to the flues, Mr. Mac'Pherson stated that he had dampers upon them to keep out the cold air during clinkering, but that he could not get the flues to pay for the dampers. He said that the objection to the setting on He (Mr. Mc'Gilchrist) had tried very much the same thing as Mr. Mac'Pherson, and failed for a similar reason, because when a stoker had to do clinkering the work was so hard that although the cold air that rushed in did harm, it benefited him. Mr. Mac'Pherson also directed attention to the enormous height at which the retorts were often set. He could say that the more there may be coming in from the cold air, in such a position the sooner it was got rid of the more creditable would it be to gas managers. Mr. Smith, of Helensburgh, urged an objection to the setting in so far as the damper was too near to the front of the retorts. At this point sight this objection did seem reasonable, but practically it was found that the damper could be set at a distance of 12 inches from the front, and he was glad to hear Mr. Epslin say that there was no difficulty in heating his setting of four retorts, because with four retorts one did not require to have the arch even an inch wider than the setting of three retorts, and consequently it would be expected that there would be a greater saving in the cost of the arch in the case of four retorts than in the case of three. He was of opinion that vertical retorts for the production of gas would never be commercially successful; while for the setting which he had brought forward

before the meeting he claimed that it occupied less space in the retort house per 1000 cubic feet of gas produced, that the flues were easy of access, and that by it more labour could be obtained from a man than by any other setting. Besides there was no difficulty in maintaining good heats.

Mr. J. Esson (Wolverhampton) said in the South they aught retorts in a bunch—three, three, and two—firing with coal. There was a difficulty with the top retorts, which were a little high. As to round retorts, they were not so good as the D-retorts, but they were not so difficult to stop using them. He could not make so good work with them, as the coal he used did not give off its gas so quickly as cannel coal, and if by mistake a little too much had been put in, they took out the charge as black as when it was introduced in the flame. He had not used them for some time, but he did not get more than 5000 or 6000 ft. of gas per mouthpiece. They were now going back to settings of D-retorts, putting them up in beds of eight, and it was a pleasure to work them. The only difficulty they had was that the men complained that they could not draw them so

The President said it was clearly shown by the discussion that gas managers were as divided about retort-settings as in regard to the other apparatus of gas-works, but he thought they were all deeply indebted to Mr. McGilchrist for his paper.

A vote of thanks was then passed to the author.

(To be continued.)

BOLTON CORPORATION GAS SUPPLY.

PROPOSED REDUCTION IN THE PRICE OF GAS

At the Quarterly Meeting of the Bolton Town Council on Wednesday, the 11th inst.—the Mayor (Mr. H. M. Richardson) in the chair—the minutes of proceedings of the Gas Committee for the past year were presented.

Alderman Moscoron, in moving the confirmation of the minutes, said that he had to congratulate the Council upon the pleasing fact that as a result of the Gas Committee's proceedings during the past year the revenue account showed profits to the unprecedented sum of £41,479 2s. 6d.; interest on loans, £4,908 9s. 11d.; and sinking-fund account, £978 8s.—there was left a net profit or available balance of £23,980 19s. 7d. In regard to this balance, after long deliberation the Committee had passed a unanimous resolution, reading:—“That £20,000, £379 10s. 6d. and £978 8s. 6d. be appropriated, viz., 15 per cent. for depreciation of works and plant, £6955 8s. 11d.; to reserve-fund account, £7000; and to district rates account, £978 19s. 2d. This would absorb the available balance. Advertising to the capital account, which would be £1,497 10s. 6d., would leave £19,482 10s. 6d. to be carried over to the year 1904, and would be ascertained when he stated that during the eight years the gas-works had been in the possession of the Corporation not a single penny had been placed to the credit of the works and plant account for depreciation, except the allowance made last year for old lifted meters. This year would be a great improvement, and would show a very marked improvement in the course adopted by the Committee in reference to the capital account—viz., of placing to its credit 11 per cent. this, and 2 per cent. next year as depreciation from revenue account—having discontinued the renewal-fund, and transferred the present renewal-fund account to the credit of depreciation, and transferred the present depreciation account to the credit of revenue, namely, £5869 0s. 8d., which, with 11 per cent. on revenue account for depreciation, amounted to £12,824 9s. 1d., thus leaving the capital account standing at the present date £458,542 7s. 4d., instead of £171,367 6s. 5d. In lieu of this, the Corporation had a reserve-fund account of £6612 10s. 6d. placed in its functions, but a little more comprehensive in its character, and had placed to the credit of that account the sum of £7000, as already intimated. The increase of profit on revenue account this year over last was £7903; the increase of gas-rental was £2109, and the increase of profit on supplies a considerable £2415 10s. 6d. The total profit for the year 1903 was £6612 10s. 6d., the total profit on this one article alone this year was £6867 8s. 9d. The two items referred to indicated an increase of income, whilst there were for decrease on income—Bank interest, £176; coke, £99; tar, £309; other items, £2415 10s. 6d. The expenditure for the year 1903 was £6612 10s. 6d., left balance of £5848. The expenditure decrease—Channel and coal, £2871; repairs, £420; bad debts, £271; other items, £33; amounting altogether to £3095. The expenditure increase was—Retorts, £281; general expenses, £322; rates and taxes, £247. The great increase in the gas-rental was due to the fact that the Corporation had raised the two years income-tax in one. Those items amounted to £7903 as the increase of profit over that of last year. He deemed it only right to say that, to obtain these favourable results, the energy and ability of the Gas Committee had been sustained by the efforts and devotion to duty of the Council, and the assistance of the Council members, more particularly to Mr. A. C. Fraser, the Engineer and Manager, and to Mr. Welch, the Office Superintendent and Cashier. He had to ask the Council to endorse with their unanimous approval something which had reference to the fact that the Corporation had been very much interested in the gas, and was less interested in. It was this that the price of gas be reduced 4d. per 1000 cubic feet from the quarter commencing in October next. For this step he might assign various reasons, but the one patent reason was the Committee's very favourable financial position. Another was that about the same time last year the Corporation had lowered the price for gas than they in Bolton were, notwithstanding that Bolton was more favourably circumstanced comparatively than some other towns. Manchester paid 3s. per 1000 feet; Salford, 3s.; Bath, 2s. 9d.; Burnley, 2s. 6d.; and Bolton, 2s. 6d. Birmingham, 2s. 6d. and Leeds, 10s. He was of opinion that whenever the price of gas was reduced in amount, it would invariably happen that the consumption would increase sufficiently to recoup them for the reduction in price. The thought id, per 1000 feet was a fair reduction to make at this time, and this was the only one that he could suggest as a wise discretion in submitting that amount. One other fact he wished to mention was this, that before long the gas department would have to go to Parliament for further powers, and if they showed an unreasonable amount of regard for the gas, it might be necessary to ask the Council to make a request, if they might stand shoulder to shoulder, that they might be equal to any other town in Lancashire similarly circumstanced.

Mr. GREENHALGH seconded the motion.

Mr. BRADSHAW asked whether 2 per cent. was a sufficient allowance for the depreciation of property like gas-works. Ordinarily the depreciation was 5 per cent., and he feared that the estimate made some time ago by the Manchester Corporation Committee, that the capital account for gas in the borough was considerably above that of the Manchester Corporation, he (Mr. Bradshaw) thought the percentage should be larger than was proposed. One town mentioned was paying 1s. 10d. per 1000 feet for gas, and he should like to have had a larger reduction of price in Bolton, because he did not see the advantage of the estimate made for the other towns. He thought the rates on the other hand, he preferred that every tub should stand on its own bottom.

Alderman WOLFENDEN was sure there was no person in the Council who

* We hope, in an early number of the JOURNAL, to illustrate the system to which Mr. Nelson referred.

The report was approved, and it was decided that the Clerk should see Mr. Bartholomew, so that, immediately on the provisional agreement being entered into, a prospectus should be prepared and issued to the public. The new Company was then formed, and the Act enabling it to procure a supply of water from the Rawcliffe borings, situated on the banks of the Goole and Knottingley Canal. Some time ago several gentlemen endeavoured to purchase the water-works, but were refused, on the ground that it was their way, contending that the water-works should belong to the town and not to a private company. This new proposal is a compromise made by the Aire and Calder Navigation Company for the good of the town. The water-works are now in the hands of the Aire and Calder Navigation Company, and they have obtained their extensive rights, which Parliament conferred upon them in 1879.

CAMBRIDGE UNIVERSITY AND TOWN WATER-WORKS COMPANY.

As briefly recorded in the last number of the JOURNAL, the Ordinary Half-Yearly Meeting of this Company was held on Friday, the 6th inst.—The Rev. Dr. Oakes, Provost of King's College, in the chair.

The Directors, in their report for the half year, recommended a dividend on the consolidated stock and on the amount paid on acceptance of the new £2 18s. shares for the half year ending July 3, 1880, at the rate of 10 per cent. per annum, which would leave a balance of £4. 9d. to be carried to the next account, reducing the previous balance by £21 18s. 3d. The Directors further reported that being advised that the proposed increase of the assessment of their works from £1000 to £2807 was excessive, they were taking steps to obtain an equitable reduction. Mr. H. Tomlinson, the Company's Engineer and Manager, reported that during the past half year the Company's water had been used on to 220,000 cubic feet, and that the number of premises now supplied was 7393. The erection of the new boiler at the water-works had been completed, and the works generally were in a satisfactory state.

The CHAIRMAN moved that the reports of the Directors and the Engineer and Manager be entered on the minutes. He said that the Directors were advised that the proposed assessment of their works at £2807 was excessive, and they were taking steps to obtain an equitable reduction in the amount. He did not suppose that many of the Shareholders would object to this. In 1870 an increase in their assessment to £2350 was notified to the Company. At that time it was £308. The matter was discussed before the Assessors, and negotiations were entered into with them, and ultimately the claim was reduced from £2350 to £1000. Since 1870 the Company had been paying on this assessment. He was happy to be able to say that on this occasion, instead of taking any money out of their reserve-fund to complete their dividend, they had charged some expenditure on the new boiler, and the water-rates had increased during the last year, together with the sundries and fittings account. There was a very unusual item in the Cherryington Estate account, which was, however, a very legitimate one, of profit from the estate for trees which it had been considered necessary to cut. He did not know that there were any other remarks to make except to congratulate the Shareholders as usual upon the prosperity of the Company. It was very clear that at the present time one would rather invest money in water than in land.

Mr. J. SWAN seconded the motion, and it was agreed to.

The CHAIRMAN moved that the dividend as recommended by the Directors be paid.

Mr. W. C. HALL seconded the motion, and it was agreed to.

On the motion of Dr. FAWCETT, seconded by Alderman DICK, a vote of thanks was accorded to the Chairman.

The CHAIRMAN briefly acknowledged the vote, and the meeting concluded.

CARDIFF WATER-WORKS COMPANY.

On Wednesday, the 4th inst., the final meeting of this Company was held—Mr. GRIFFITH PHILLIPS presiding—when the Directors reported that the Royal Assent had been given to the Company's Bill of the present session, and that they were about to recommend the disposal of the remaining assets in accordance therewith. The accounts presented showed the receipts and payments by the Company since the 29th of September, 1879, with the total amount already distributed on account amongst the Proprietors; and, after allowing for debts and liabilities, a balance (including £485 10s. 6d.) of the amount of the reserve fund of £71,297 18s. 6d. remained available for disposal, according to Act of Parliament. This provided that the balance of the purchase-money, after payment of debts and liabilities, should be applied—“First, in paying any such sum or sums of money as the Company may, by resolution at an extraordinary general meeting, order to be paid by way of compensation for loss of office to officers, servants, and other persons connected with the Company; secondly, in paying to each of the Proprietors a sum (less the amount of £200 per cent. already distributed), calculated at 25 years purchase of the maximum statutory dividend payable on the stocks or shares held by them; and thirdly, in paying a rateable dividend of the balance or residue among the Proprietors in proportion to the amount of capital paid up by them respectively.” The Directors recommended certain compensations to their officers and workmen—amounting, in all, to £3535—and that £300 should be kept in hand to meet expenses and claims that had not been sent in.

The SECRETARY (Mr. T. G. South) read the notice convening the meeting, after which

On the motion of the CHAIRMAN, the report was adopted; but it was agreed, after much discussion, to reduce the compensation payable to the officers of the Company from the amount proposed by the Directors to a total of £2390.

A vote of thanks was then passed to the Directors for the great care and attention that they had uniformly given to the interests of the Company, and for the able manner in which they had conducted the arrangements with the Cardiff Corporation to a satisfactory conclusion, and an honorarium of £100 was awarded to each of them as an acknowledgment. It was also resolved that £50 should be given to Mr. Richard Evan Spencer, the Company's Solicitor, in acknowledgment of his able and careful attention to the legal business of the Company.

The proceedings, which were most harmonious throughout, the only division being on the subject of the compensation to be awarded to the officials, closed with a hearty vote of thanks to the Chairman for presiding, and for the able manner in which he had conducted the meetings of the Company.

The following comparison of some items in the accounts of the Company for the 10th inst. and the year 1879, and June, 1879, will show the strides made during 12 years:—

	1867	1879	Percentage of Increase.
Paid-up capital	£82,737	£121,737	50
Gross revenue, half year	2,554	3,514	37
Net revenue, including income-tax	2,398	5,940	150
Directors, half year	50	300	300
Salaries and collection	342	553	60
Rate of dividend per annum	5s 6d and 6s 7d and 12s	7s	70
minus income-tax		plus income-tax	

KIDSGROVE GAS COMPANY.—The ordinary general meeting of this Company was held on the 13th inst.—Mr. J. Gater in the chair. The Secretary (Mr. T. Wardle) read the statement of accounts, which showed that, after the usual expenses had been met, there was an available balance of £210 to be carried to the reserve-fund. The consumption of gas had fallen off very considerably during the year, owing to the bad state of trade; still it was now fairly good. The Chairman said the plant was in excellent working order, and he had no doubt the Shareholders would all be satisfied with the statement of accounts. It was sure they were well pleased to learn that the Directors had paid a dividend of 7 per cent. on the new, and 10 per cent. on the old shares, and carry forward £210 to the reserve-fund. He had pleasure in moving the adoption of the report, and that the dividends recommended be declared. Mr. Garlick seconded the motion, and it was carried. The retiring Director (Mr. Maddock) was re-elected, and Mr. Brindley was re-elected Alderman.

GLASGOW CORPORATION GAS SUPPLY.

As briefly recorded in our “Trade Notes from Scotland,” in the JOURNAL of the 10th inst., at the meeting of the Glasgow Town Council on Thursday, the 13th inst., the minutes of the meeting of the Glasgow Gas Committee for the year ending March 31, 1880, were presented. They showed that the gross revenue for the twelve months amounted to £341,274 13s. 1d., and the gross expenditure for the same period (including £30,271 13s. 1d. written off capital for depreciation) to £327,351 4s. 3d.; the balance carried to profit and loss account being £8,923 8s. 10d. Out of this the following sums had been provided, viz.—(1) Annuities on stock, £34,038 5s. 8d.; (2) interest on borrowed money, £24,776—£58,794 5s. 8d.; (3) sinking-fund, £11,346 18s. 7d.—total, £70,141 18s. 3d.; leaving a surplus on the year's operations of £18,784 10s. 7d. The balance carried to profit and loss account, £34,928 6s. 3d., and the sum to be carried forward to next year's account amounted to £48,930 13s. 10d. After advertising for tenders, the Committee had concluded contracts for the supply of the coals required during the year now current, on what they considered favourable terms for the Corporation; and they recommended to the Town Council that the price of gas be further reduced from 3s. 10d. to 3s. 8d. per 1000 cubic feet—this reduction to take effect retrospectively as from the date of the last survey. The quantity of gas sold and accounted for during the past year was 1,577,466,000 cubic feet, being an increase of 28 per cent. over the preceding twelve months. The sinking-fund, with its accumulations of interest, amounted to £88,361 4s. 3d. The Committee had agreed to report that the works were in good and efficient working condition. In conformity with the expressed wishes of the Town Council, the works at Partick had been closed, and the plant disposed of. As the result of this change considerable savings had been effected in buying new pipes, but no extensions had been necessary at either of the other works. The result of this change there was no doubt that an important annual saving would be effected. During the last four years about £47,000 had been spent, and charged to revenue, in renewing and repairing the service-pipes, and in examining and repairing the mains throughout the city. The result of this important work had been to reduce the leakage from 19 to 10 per cent., and the Committee hoped, by continued attention to the state of the mains and service-pipes, still further to reduce the quantity of gas annually unaccounted for. The greatest quantity of gas consumed in 24 hours during the year was 11,425,000 cubic feet, being less than the maximum consumption in the previous year by 1,000,000 cubic feet.

Mr. WALLS moved that the accounts should lie on the table till next meeting, and that the price of gas be reduced from 3s. 10d. to 3s. 8d. per 1000 cubic feet. Referring to the accounts submitted, he compared the results for the year just closed with those of the year 1870, which was the first year the gas-works were opened, and the result was very satisfactory. It showed that a very important annual saving had been effected. It so happened that the price of coal was as nearly as possible the same in the two years, while the price of gas was 3s. 3d. per 1000 feet in 1870, as against 3s. 10d. in 1880. The coals in 1870 yielded only 8719 cubic feet of gas per ton, while in 1880 they yielded 10,740 cubic feet. The result was that the cost of effecting being £16,800. The leakage of gas in 1870 was 20 per cent. This had been reduced to 15 per cent., the saving effected being equal to the sum of £6800. This estimate of saving was, he said, based on the cost of manufacturing the gas; if it had been based on the market value of the gas sold, it would have been very much higher, and he wished to point out the favourable figures at the minimum. The cost of manufacture in 1870 was 9d. per 1000 cubic feet, whereas in 1880 it was reduced to 7½d., which showed a saving of £11,900. At this point the comparison ceased, but it would be noticed that the saving was a very large one. Under the new system of working, the amount of gas sold for the year 1879, and the annual revenue had been increased by about £7000 per annum. The interest payable on money borrowed on mortgage had been reduced by about £1100. These were all annual savings, and in the aggregate amounted to £42,400. If a comparison were made with 1874, which was really the worst year of the Company's history, the savings would have been £45,000. He further mentioned that while there had been a considerable saving in the manufacture of gas, there had also been a saving in the purchases of coal. Purchases of coal had also been effected for the current year, and the saving would be about £9000 as compared with the price in 1879. He thought in all these circumstances the Corporation had to congratulate themselves on the result of their working of the gas undertaking. The price of gas had now been reduced to 3s. 8d. per 1000 cubic feet, and he was not without hope that the price would be still further reduced. The present satisfactory state of matters had only been brought about by a high degree of economy and the most efficient management, not only by the officials, who had acted most efficiently, but also by the members of the Gas Committee. It would be observed that there was a large balance now standing at the credit of profit and loss account. The amount was £48,930. He considered this amount should be at once dealt with, and he intended to propose a motion on the subject. He thought the sum should be reduced one-half. An estimate had been made of the revenue for next year, according to which it was anticipated that there would be a balance to profit of about £7000. The motion he had to propose was in the following terms:—“That a further deduction of 2½ per cent. be written off capital for depreciation of the works and plant used for the purpose of funding sewerage, which do not appear in the revenue account.” Allowance has been made for interest on capital. Next year a sinking-fund will have to be commenced to pay off the latter, and the Board must put aside 1 per cent. per annum. The consumption of water for the year ending June 1, reached 93,830,000 gallons, and for the last two months the average has exceeded 730,000 gallons per week.

The minutes were approved of.

OSSETT WATER SUPPLY.—The Ossett Local Board are congratulating themselves upon having made their revenue from the water-works clear the expenditure, and even leave a margin for profit. The Act empowering the Board, among other things, to construct water-works was obtained in 1875. In pursuance of its provisions, a ten years agreement was made with the Leeds Corporation to buy a certain quantity of water, and to supply 1000 gallons, increasing yearly till it reaches 300,000 gallons, at 8d. per 1000 gallons—two-thirds to be paid for, whether consumed or not. £20,500 was expended by the Board in making a conduit from Staincliffe, a reservoir at Gawthorpe, and in laying service-mains. Two or three years were required in the construction of the works, and the water was put in working order, and for some time the Board had to pay for more water than they were using. The Assistant Clerk has, however, prepared a statement for the year ending March last, showing a revenue of £2400, and a profit on the year's working of £233. Considerable quantities of water have also been used for other purposes, such as funding sewerage, which do not appear in the revenue account. Allowance has been made for interest on capital. Next year a sinking-fund will have to be commenced to pay off the latter, and the Board must put aside 1 per cent. per annum. The consumption of water for the year ending June 1, reached 93,830,000 gallons, and for the last two months the average has exceeded 730,000 gallons per week.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

A dividend of 7½ per cent. has just been declared at a meeting of the Kirkwall Gaslight Company, and the price of the gas is 7s. 6d. per 1000 cubic feet, which may certainly be regarded as a very moderate charge when it is considered that Kirkwall is sixty-four miles north in the Orkney Islands, almost in the *Ultima Thule* of the United Kingdom, and that the gas has the high quality of what is very generally produced throughout Scotland.

A special meeting of the Police Commissioners of Kilmory was held last Thursday—Protest Whyte presiding, at which it was agreed, after considerable discussion, to propose the following resolution, which was moved by Protest Whyte, and seconded by Mr. Reid:—"That the Commissioners resolve, under the Burgis Gas Supply (Scotland) Act, 1876, to adopt the said Act, and appoint Monday, the 22nd of November next, for holding a special meeting in order that the resolution may be confirmed." No amendment was submitted, and the motion was declared carried.

The usual monthly meeting of the Police Board of Greenock was held last Tuesday, at which the minutes of the Gas Committee were submitted. They included an estimate of the probable revenue and expenditure for the year ending June 30, 1881, and the results of the same, after careful consideration of the statement, the Committee had recommended that the anticipated surplus should be appropriated thus:—Police Board, £3000; reduction of value of works (the balance more or less), £1110—total, £4110. The minutes were adopted. It was also reported that the results of 25 experiments made on the quality of the gas during the last week of the month were—minimum, 25 candles; maximum, 29½ candles; average, 26.25 candles. The average illuminating power, as ascertained at the works during the same period, was 27.77 standard candles.

A reduction in the price of gas from 9s. 2d. to 8s. 4d. per 1000 cubic feet has just been made by the Gas Company of Gatehouse-of-Fleet, Kirkcubrightshire.

Business was done on Friday in Edinburgh Gas Shares at £46 15s. per share; and on the same day Glasgow Corporation 9 per cent. Gas Annuities were disposed of at £225 per share, while the 6 per cent. annuities brought 100 shares at £156 10s., or an advance of £1 10s. from the price quoted on the preceding day.

On Friday, the 13th inst., 100 shares in the Stirling Gas Company were offered for sale by public auction in Stirling. They were put up in lots of 10 shares, at the upset price of £4 10s. per share. Competition was keen, and the bidding continued till three lots of shares were sold at £4 16s., five lots at £4 17s., and two lots at £4 18s. per share—making a total of £484 10s. for the 100 shares.

The Police Commissioners of Aunan are proceeding energetically with the preliminary arrangements connected with the contract for carrying off their water supply scheme; and substantial progress is being made with the new drainage works.

The income derived by the Ayr Town Council from water-rates during the past year amounted to £5484, and the expenditure was £4693; giving an excess of income over expenditure of £790. In the previous year there was a surplus of £1000.

For the following year the rates to be levied under the Fodur Water Act are—public rate on owners, 3d. per £1 of rental; occupancy rate, 2d. per £1; domestic rate, 1s. 4d. per £1.

In a densely crowded meeting of ratepayers held at Hawick some days ago, it was resolved by the overwhelming majority to disapprove of the Fodur water scheme as adopted by the Town Council, and to approve of the Allan water scheme. Only 19 persons voted for the amendment approving of the Fodur scheme. There is a great amount of agitation in the town in regard to the matter.

At the last meeting of the Town Council of Oban it was unanimously resolved to go to Parliament next year for power to bring an additional supply of water to the town, the present supply being quite inadequate to meet the wants of the rapidly increasing population.

Last week's Glasgow pig iron market was very firm, and prices steadily moved up to a high level. On Friday, the 20th inst., the closing prices were 55s. 6d. cash, and 54s. 9d. on delivery. There were 40 blast furnaces in operation, as against 118 some ten days ago.

In consequence of the strike of the miners, the coal trade is quite disorganised. A large number of the collieries have given the advance of wages asked, and there has been a general rise in the price of coal.

REDUCTION IN THE PRICE OF GAS BY THE GENERAL GAS COMPANY.—The Directors of this Company have decided to reduce the price of gas from 5s. 5d. to 4s. 11d. per 1000 cubic feet.

REDUCTION IN THE PRICE OF GAS AT HULL.—The British Gas Company have given notice that the price of the gas supplied by them in Hull will be reduced to 2s. 3d. per 1000 cubic feet from the 1st inst.

REDUCTION IN THE PRICE OF GAS BY THE CALVERLEY AND HORSFORTH GAS COMPANY.—The Directors of this Company have reduced the price of gas from 3s. 9d. to 2s. 11d. per 1000 cubic feet, the reduction to date from the 1st of July last.

SALE OF SHARES IN THE YORK GAS COMPANY.—On Tuesday last Mr. Richardson sold by auction in York 32 old shares in the York Gas Company at the rate of 10s. 6d. each, and 30 at £10 12s. 6d. each; 24 new shares at £7 5s. 6d. each.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—The fifth annual meeting of this Association will be held this week at Swansea, and a most successful gathering is expected. A very interesting programme of excursions has been issued, as many as twenty separate appointments having been made for next Saturday and the Thursday in next week. One of the Honorary Secretaries of Excursions is, we notice, Mr. Thornton Andrews, M. Inst. C.E., Secretary and Manager of the Swansea Gaslight Company.

KNOTHORN (RADNORSHIRE) GAS COMPANY.—The annual meeting of this Company was held on the 12th inst.—Mr. J. M. Rocks in the chair. The balance-sheet and Directors report showed the affairs of the Company to be in a very prosperous condition. The usual dividend of 7½ per cent. was declared, and £40 ordered to be carried to the reserve-fund. Extensive improvements are being carried out at the works by the erection of two large purifiers, new condensers, station-meter, governor, &c. A new lime shed has also been built. The retiring Directors (Mr. J. M. Rocks and Sir R. B. Price, Bart., M.P.) were re-elected, as was also the retiring Auditor (Mr. W. Jones).

WHITWORTH VALE GAS COMPANY.—It appears from the half-yearly report of this Company that the gas supplied during the past six months has amounted in value to £1592, being an increase of £170 over the corresponding period of last year. The result of the half year's working is a dividend of £374 3s. 11d., which, added to £73 7s. 6d. brought from last half year, gives a disposable balance of £448 10s. 9d., out of which the Directors recommend that a dividend at the rate of 5 per cent. per annum be paid, free of income-tax, and the balance of £23 4s. 6d. be

carried to the reserve-fund. The dividend last half year was at the rate of 7 per cent. per annum, and for the previous half year at the rate of 5 per cent.

NEW WATER-WORKS FOR LITTLEHAMPTON.—On Saturday, the 14th inst., the Mayor of the town stood at the water tower in connection with the extensive new water-works now in course of completion for the supply of Littlehampton, was laid by his Grace the Duke of Norfolk. The town was en fête and gaily decorated, and the reception accorded to the Duke and Duchess was most enthusiastic. In the course of the proceedings Mr. Whitehead, Chairman of the Local Board, explained that it was only after unsuccessfully sinking two wells—one of them to the depth of 500 feet—that they had tapped, by means of boring, the present abundant stream, which would yield 168,000 gallons per day. After the ceremony the Duke and Duchess were entertained at luncheon.

DONCASTER CORPORATION GAS SUPPLY.—At the meeting, on Friday, the 13th inst., of the Gas Committee of the Doncaster Corporation, it was resolved that £1000 of the surplus profits of the past year should be transferred to the borough fund. The Chairman of the Committee (Alderman Clark) reviewed the business of the gas department during the current financial year, which will close on the 31st inst., and expressed his hope that Mr. Bridge, the Chairman of the Local Board, would be able to reduce the price of gas, 11d. per 1000 feet. He thought the consumers would have no cause to complain when the reduction was made, as there were few towns that had the same quality of gas, in respect to illuminating power and purity, as at Doncaster. The works, he said, were now in excellent order, and Mr. Bridge, he thought, would be able to reduce the price of gas, 11d. per 1000 feet, then resolved to increase Mr. Bridge's salary, from the 1st prox., by £50 per annum in consideration of the efficiency with which he has discharged the various and important duties of his office from the time of his first appointment.

PONTEFRAXT GAS COMPANY.—The half-yearly general meeting of this Company was held on the 10th inst., when the report of the Directors and the account of the half year's working to June 30 last were presented. From the latter we learn that £1863 10s. 2d. had been received from the sale of gas, and £71 17s. 4d. for meter hire; the residual products had produced £401 16s. 3d., and a small sum of £4 5s. received for rent made up a total of £2456 10s. 2d. During the half year the coal used had cost £426 0s. 9d.; £238 18s. 9d. had been paid in wages; £159 4s. 6d. for management; repairs, &c., had cost £153 7s. 5d.; while rent, rates, and taxes came to £42 9s.; other items on the expenditure side bringing up the total to £1066 16s. 3d.; leaving a balance of £1374 13s. The Directors in their report stated that there was a sum of £235 3s. 7d. available for dividend among the Shareholders, and of this they recommended that a dividend of 10 per cent. per annum should be paid. The Company's share capital already called up is £16,000; and they have raised on loan £2500—total, £18,500. There had been expended on capital account to June 30 last, £20,142 7s. 4d. There is £16,000 of capital still unissued.

THE PRICE OF GAS AT OLDHAM.—At the meeting of the Oldham Town Council, on the 10th inst., the report of the Directors and the account of the Committee's minutes were brought up. Mr. Partington asked if it was the intention of the Committee to reduce the price of gas. He thought that, with the large contracts that were out at very low prices both for coal and canal, a great reduction ought to be made in the price of gas. Leeds was reducing the price to 1s. 10d. per 1000 feet, and other large towns were making reductions, whilst the price at Oldham was 2s. 2d. per 1000 feet with 1s. per 1000 discount to people who paid their accounts within a month. He considered that if at Leeds the Town Council could sell gas at 1s. 10d. per 1000 feet, the Oldham Council could sell it at less than 2s. 2d. per 1000 feet. The Gas Committee ought to consider the advisability of reducing the price. Mr. S. Buckley (Vice-Chairman of the Gas Committee) said the Committee had not the matter under consideration, and personally he was afraid there was a broader question in it than the Committee would have to deal with, because it involved other interests in the town. He did not think the Committee would, without further suggestion, reduce the price of gas, enter upon the question at the present time. The subject then dropped, and the minutes were confirmed.

NEWPORT (MON.) GAS COMPANY.—The half-yearly meeting of this Company was held on the 10th inst.—Mr. T. Gratx in the chair. The Directors, in their report, recommended the payment of the usual dividend of £1000 to be reduced to £800, and asked for the reduction of depreciation-fund, and determined to reduce the price of gas from June 30 last. The Engineer reported that the whole of the works were in satisfactory order. The revenue account presented showed that the gas sold for public and private lighting had produced £8640 17s. 9d.; meter-rents, £331 4s. 4d.; residuals, £195 1s. 5d.; rents, &c., £38 9s. 10d. total, £9205 5s. 5d. On the expenditure side of the revenue account, the manufacture of gas had cost £4369 16s. 2d.; distribution, £595 0s. 8d.; public lamps, £253 4s. 1d.; rents, &c., £774 1s. 5d.; management, £677 0s. 11d.; depreciation, discounts, &c., £818 12s. 10d.—total, £7487 16s. 1d., leaving a balance of £2008 5s. 2d. The Chairman then approved the adoption of the report and accounts, and the declaration of dividends at the rates of 5, 3½, and 3½ per cent. on the several classes of stock and shares, and the motions were agreed to. The retiring Directors and Auditor were re-elected, and the proceedings closed with a vote of thanks to the Chairman and Directors.

DISS GASLIGHT COMPANY.—The annual meeting of this Company was held on the 9th inst.—the Rev. C. B. Manning in the chair. The Secretary (Mr. Garrod) read the balance-sheet, from which it appeared that the gas sold during the year amounted to £1167 12s. 9d., against £1341 last year. With regard to this difference, it was explained that it was principally the consequence of the reduction in the price of gas from 5s. 5d. to 4s. 11d. per 1000 feet during the past half year. The amount received for meter-rents, coke, tar, &c., showed a slight falling off compared with the previous year, the total assets, including a balance in the bank, amounting to £2698 18s. 4d. The profit and loss account showed a profit on the year's working of £440, against £614 in the previous year, which was stated to be quite an excellent period. The Directors then considered the reduction in the price, there was very little difference. In reply to a Shareholder, Mr. Garrod said there was a difference of 275,000 cubic feet in the quantity of gas made this year and last. The accounts were received and adopted, and a dividend of 10 per cent. was declared. The retiring Directors, Messrs. Mearns, Mott, and Bobby, were re-elected, and Mr. Qualling was elected in the place of the late Mr. J. T. Muskett. Mr. J. Aldrich was re-appointed Managing Director, and the proceedings closed with a vote of thanks to the Chairman.

TRURO WATER COMPANY.—The half-yearly general meeting of this Company was held on the 18th inst.—Mr. J. Henderson in the chair. The Directors reported that, notwithstanding the fact that it was necessary to finish the undertaking, they had not, from want of funds, been in a position to carry out the necessary requirements of the Engineers. There were about 60 services laid on, the supply of which had given entire satisfaction, and if the Directors had not, from the causes before mentioned, been in this completely exhausted position, they would have been in a position to be using the Company's water. In moving the adoption of

the report, the Chairman drew attention to the fact that, although there was a comparatively small number of consumers of water, there were a great many applications from other parts of the town where the Company's mains were not yet laid. £5000 was required to complete the additional works, and a gentleman had offered to subscribe £1500 if the remaining £1500 could be raised elsewhere. How that was to be raised he was not in a position to say, but this was the sole thing that was keeping the Company from getting into thorough working order. Mr. Hoard seconded the motion. Mr. Shelford (the Company's Engineer) stated that the additional works required consisted only of the mains to be laid in the upper parts of the town. Having thoroughly examined all the property of the Company, he found that there was an ample supply of water, and it was extremely pure. He assumed the meeting was only necessary for the Company to get into thorough working order to not only meet costs, but in a short time to pay well. A vote of thanks was passed to the Solicitor and Secretary, and the proceedings terminated.

SEVENOAKS GAS COMPANY.—The report of the Directors of this Company, presented at the eighth half-yearly general meeting, held on the 11th inst., stated that the undertaking continued in a sound and prosperous condition. Considerable sums had been expended on extensions of mains and for the repairs and maintenance of plant. The consumption of gas and the sale of residuals had been heavier than in the corresponding period of the previous year; yet, owing to the reduction that had been made in the price of gas, the amount realized had not been so great. The result of the Company's operations was, however, a profit of £810 11s. 8d. for the half year. There was a sum of £584 14s. 5d. available for dividend, which the Directors recommended should be at the rate of 10 and 7 per cent.; this would absorb more than the amount at their disposal, and therefore they purposed making up the difference from the reserve fund. The accounts accompanying the report, published at 16s. 1d. had been received from the sale of gas; meter-rents, £72 9s. 9d.; residuals, £546 18s. 9d.; service laying, £11 6s. 7d.—total, £2876 7s. 2d. Against this there had been expended for coals, £900 14s. 9d.; wages, £247 19s. 6d.; rent, rates, and taxes, £496 3s. 9d.; management, £271 10s. 1d.; repairs, and sundry other charges, £156 4s. 6d.; the miscellaneous items making up a total of £2905 12s. 6d., leaving the balance of £810 11s. 8d. for dividend, as stated in the report. The capital account of the Company showed that there had been received up to the 30th of June last £50,784 10s.; expended to Dec. 31, 1879, £24,470 4s. 11d.; since that date £4149 10s.—total, £28,613 8s. 11d., leaving a balance unexpended of £2181 9s. 1d.

SOUTH HANTS WATER COMPANY.—The half-yearly general meeting of this Company was held on the 11th inst.—Mr. G. Croft in the chair. The Secretary (Mr. R. M. Young) presented the Directors report, which stated that steady progress was being made in the supply of houses, an average of over 50 per month having been laid on since the commencement of the year, and there was every appearance that the desire for the Company's water was becoming more general. Several new water services had been arranged, and on June 30th 587 services had been supplied, with an estimated rental of £1100. Another inquiry into the state of the district had been instituted by the Local Government Board, and the sanitary authorities of the district were recognizing the advantages of having a good supply of water at hand. The water, according to the analysis, maintained its high character, and was reported to be very abundant. The Chairman, in moving the adoption of the report, congratulated the meeting on its satisfactory character. Looking at the fact that the Directors had been able to put on something like £60 per month, while the Company had only been in existence practically three years, and that their present water-renal was about £1300 a year, he thought their congratulations were fully warranted. That this state of things would continue to improve they were fully justified in believing. Southampton was a flourishing place, and they had the advantage of being outside the borough, while having all the advantages of being immediately adjacent thereto. The financial position of the Company was this, that at the end of the year they would have sufficient water-rents to pay all expenses, and there was every probability of their being able to pay a dividend. He had taken the trouble to find out the exact number of consumers in the Company's district, and it was 4000 at present on the use of the mains, and 5000 for which extensions would have to be made. They had the raw material to work with, and if the Shareholders had confidence in the Directors, they thought they would soon be able to pay a dividend of 10 per cent. Lord Edward Churchill seconded the motion, which was carried. The usual vote of thanks was accorded to the Chairman, and the proceedings terminated.

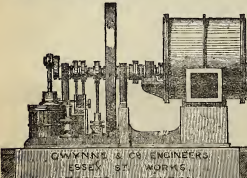
The Directors of the Cleveland Gas Company have just paid a dividend at the rate of £1 5s. per cent. per annum for the six months ending June 30 last, which is 3½ per cent. less than the dividend paid for the half year ending Dec. 31, 1879.

PETERBOROUGH GAS COMPANY.—The report of the Directors of this Company for the six months ending June 30, presented at the last half-yearly meeting, stated that the balance of profit and loss account—£2862 9s. 9d.—allowed, after payment of a dividend of 5 per cent. on the preference shares, of the declaration of the maximum dividend on the remaining share capital of the Company, and would leave a balance of £87 4s. 9d. to be carried forward. The accounts for the past half year showed that the sale of gas had produced a revenue of £4963 1s. 2d.; meter-rents, £117 2s. 3d.; residuals, £1478 6s. 1d.; gas-fittings and sundries, £41 1s. 10d.; and there were stocks on hand of the value of £219 8s.; making a total of £6617 6s. 4d. The sum expended in the manufacture of gas was £2193 5s. 11d.; repairs, &c., had cost £414 18s. 3d.; manufacture of sulphate of ammonia, £270 3s. 4d.; rent, rates, and taxes, £204 12s. 2d.; management and other expenses, £686 8s. 8d.; miscellaneous, £196 13s. 7d. Adding to this the value of stocks on hand on Jan. 1, £920 12s. 2d., made a grand total of £4986 18s. 1d., showing a balance of £2330 8s. 3d. The Company have raised on share capital, £39,150; and on mortgage, £5446 10s.—total, £44,596 10s.; and this amount, less a balance of £259 17s. 1d., had been expended on works up to June 30 last. The following is the working account for the past year, as furnished by the Company's Engineer and Manager (Mr. G. Ernest Stevenson):

Coal carbonized	4986 tons.
Gas produced	52,273,100 cub. ft.
Gas sold	46,093,423 "
Gas unaccounted for and used on works	16,833,677 cub. ft. or 11'82 per cent.
Gas made per ton	10,680 cub. ft.
Gas sold per ton	9,415 "
Cost of coal per ton	14s. 0d.
Residuals realized per ton of coal	9s. 3d.
Total working expenses	£2351 1s. 0d. or 68 p. ct. of cost of coal.
	or 13s. 9d. per ton of coal.

ROCHDALE CORPORATION GAS SUPPLY.—At the meeting of the Rochdale Town Council on Thursday, the 5th inst.—the Mayor in the chair—the minutes of the Gas Committee were brought up for approval. Alderman Shawcross asked how it was the Council were not furnished with the statement from the Gas Department which used to be found so convenient. When statements that gas in other towns could be sold for 1s. 10d. per 1000 cubic feet were seen, the question naturally arose why people in Rochdale should be charged so much as they were. Alderman Littlewood asked whether the gas being produced equal to 17½ candles was the result of using coal only, or was there a certain proportion of canal amongst the material? and whether the result was attributable to the St. John purifying apparatus. Alderman Simpson asked if the Gas Committee only intended to supply gas equal to 17½ candles in future. Alderman Tweedale was sorry the Chairman of the Committee was not present, but he could not say why the statistics were not published. As to the illuminating power of the gas, he was glad to say it was produced with the use of coal only, and it would be better if they were producing a larger quantity, as they would be when the nights grew longer. They were very well satisfied with the new purifying apparatus, and he should not recommend the use of any more canal after their present stock was used. Alderman Taylor said it was agreed in the Council several years ago that it would be better not to publish the detailed statistics referred to, though he held a contrary opinion. As to the illuminating power of the gas, he was agreeably surprised to find that such a quality as 17½ candles had been produced without the use of any canal, and it testified to the great value of the purifying apparatus, which was more valuable than they had ever anticipated. With very little canal added there could be no doubt the illuminating power would reach 18 candles or more. Indeed, if the temperature of the St. John apparatus were kept up it was probable that 18-candle gas would be produced without canal. A conversation then ensued about the propriety of making gas of a lower quality and selling it at a cheaper rate, but several members objected to any such suggestion. Mr. Romans, the new Manager, however, was, it was remarked, coming from a cheap gas town, and it was hoped that he might do all that could be done in that direction. The minutes were adopted.

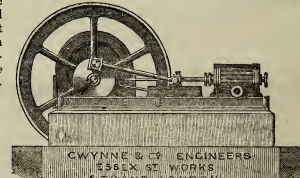
THE GRAND MEDAL OF MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS. GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



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ESSEX STREET WORKS.
STRAEND LONDON.

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GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



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ESSEX STREET WORKS.
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EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and of approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

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TO CORRESPONDENTS.

J. T. P.—*Liebig's patent is dated June 19, 1877; No. 2373. We are not aware that Klönne's furnace is patented in England.*

W. K.—*The suggestion you make, though ingenious, is not new. If you refer to the published proceedings of the British Association of Gas Managers for 1879 you will find a similar idea put in practical shape; nor is this the only instance, within our knowledge, where an attempt has been made in this direction. The question, however, still awaits a final solution; and should you be able to embody your proposal in definite form, we shall be open to publish any drawing or description of it.*

MANAGER OF SMALL COUNTRY GAS-WORKS.—*The Corporation cannot "compel" the Company to sell; but can withhold their sanction to the breaking up of streets, and so cripple the carrying on of the Company's business. The Corporation could, as the Company is non-statutory, erect competing gas-works (if the requisite permission of the Local Government Board were obtained, under clause 161 of the Public Health Act, 1875. Why do the Company not give notice of their intention to apply to the Board of Trade for a Provisional Order, under the Gas and Water Facilities Act, so as to get parliamentary authority for their operations? Then they would be in a position to meet the Corporation, in the event of their moving in the matter; and probably, as in the case of Stone—reported in the last volume of the JOURNAL, pp. 136, 329, 719—would gain the day, unless a very strong case can be made out against them.*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 31, 1880.

Circular to Gas Companies.

THE ordinary meeting of the Shareholders of the South Metropolitan Gas Company, held on Wednesday last, at which the report of the Directors and statement of accounts given in another part of this week's JOURNAL were adopted, was convened six or seven weeks earlier than usual, and was in other respects noticeable, as marking the termination of the first stage of a new departure.

The close of the first half-year's working of the greater South Metropolitan Gas Company—that young giant whose growth has received such marked impetus by the assimilation of its neighbours—is an event worthy of more than passing reference; yet so ripe is the age with similar examples of sudden development, that a running comment in a newspaper is all that can be devoted to even greater changes than have

recently taken place in the organization for the gas supply of transpontine London. Yet, to those for whom Metropolitan gas affairs possess any great interest, and to whom the history of the former Companies is familiar, the disappearance of old names, and the alteration in the conditions of things which follow thereupon, invest the half-yearly records of the remaining undertakings with the past glories of all those that have disappeared, as well as with the larger interest that centres round the future possibilities of enterprises which have proved strong enough to survive through the process of selection, and elastic enough to accommodate themselves to the vicissitudes of larger existence amid ever-changing circumstances.

In the case of the South Metropolitan Company the results of the first half year's working of the three united Companies now bearing that title, have been such as to testify in the most practical manner to the wisdom of the policy which brought about the act of union. We have on a former occasion expressed our appreciation of the spontaneous action on the part of the Directors in reducing the price charged for gas in the district of the late Phoenix Company, to the level of that of the rest of the united district, six months earlier than they need have done in accordance with the provisions of the scheme of amalgamation. It may be taken for granted that when the report for the current half year is presented to the Proprietors of the late Phoenix Company's stock they will have as much reason as the consumers to congratulate themselves on the result of the reduction, as in all probability they will then receive 11½ per cent. dividend—a consideration which will strike the Shareholders of the London Company with all the force of a painful contrast. For the present, dividends of 11½ per cent. on the "A" stock; 11 per cent. on the "B" stock (late Surrey Consumers capital), and 10½ per cent. on the "B" stock (late Phoenix capital) must be considered highly satisfactory; as is the announcement that henceforth, in consequence of the price of gas being made uniform, the two divisions of class "B" will be completely merged, and rank equally for dividend and in all other respects. It is not so very long ago that a dividend of 11½ per cent. on Metropolitan or other gas stock—not under fortuitous circumstances merely, but as a regular thing—would have been regarded as impossible. If profits permitting such a dividend could be earned, it would have been said that the consumers would have risen in arms against being "robbed" to that extent, yet in the present case we see this high rate of dividend declared in broad daylight, based on accounts passed by an Official Auditor, and yet nobody complains. This is an evidence that a great change has come over the relations of Gas Companies (in London at least) and their customers. The consumers have learned that their interests are, by the action of the sliding scale, made identical with those of the gas manufacturer, and they therefore acquiesce in an arrangement which, although comprehended perchance by few, works for the good of all.

Nothing calling for particular remark transpired at the meeting, which was only distinguished by extreme brevity and general content among all parties concerned, as under the circumstances was but natural. Nothing could be better than the present position of the Company, and, with ordinary fortune, it has a future of many years of prosperous development marked out before it.

The mania for establishing independent districts for gas supply, carved out of the district of the Birmingham Corporation gas undertaking, is still spreading. Aspirants for separation were heard at the last meeting of the Wednesbury Local Board, which locality (with Darlaston its next neighbour) is supplied with gas from Birmingham. Fired by the examples of West Bromwich, Tipton, and Oldbury, a section of the Wednesbury Board have endeavoured to get a resolution passed declaring the expediency of the Board following in the path of the Local Authorities of the aforesaid places, and taking steps to acquire the goodwill and property of the gas undertakings—other than private—within the district over which the Board exercise control. The resolution, although vehemently advocated, was not passed, the opposition to the proposal, led by the Chairman, being too strong both in numbers and, as it appears to us, in argument also. Centralization may in many things be carried too far, and in gas matters especially there is no reason why people in a place which can supply itself should pay strangers to do it for them. But the policy of establishing independent works must be clearly made out, to justify a violent rupture of existing arrangements whereby two or more districts may have been enabled to derive benefit from an establishment for which one of them is alone responsible.

It is perhaps hopeless to contend with representative bodies or corporate authorities for the observance of equity for itself alone, to say nothing of such an altogether Quixotic sense as that of gratitude. It is quite conceivable that, in past times, several separate but adjoining towns might have found it expedient to combine for the purposes of gas supply, which they were individually much too small to undertake; and, in later times, when they had each grown larger, the sudden determination of one of them to make gas for itself might be positively injurious to the place wherein the works were situated, by leaving it encumbered with a property beyond its own requirements. But no consideration of this kind can be held to apply to the present case. It is, of course, a matter of small moment to the Corporation of Birmingham whether or not they continue to supply about fifty million feet of gas per annum to a small outlying district; but from the point of view of Wednesbury gas consumers the case is vastly more important. They now have to pay from 3s. per thousand feet downwards—the diminished rates being a matter of discount—and it is very unlikely that for some years to come at least they could send out gas from works of their own at a lower price. It was stated that the district is not a rapidly growing one, which is a serious consideration in matters of this nature, and so all things present and future being fairly looked at, the gas supply might very well go on as it is. In agreeing to this conclusion, after the question had been properly argued on both sides, we think the Local Board showed sound sense.

The Scarborough Gas Company have had, during the past year, to face a period of depression, which overtook that fashionable north-eastern watering place in common with, or rather in consequence of, the corresponding dullness of trade prevailing at the same time throughout the manufacturing districts whence come the visitors who, in ordinary seasons, crowd the town. In spite of this, however, the Company's business has not suffered; their receipts for the year ending June 30 showing an increase over those of the previous year, while the cost of manufacture has been materially reduced, and the working results generally show a great improvement, not only on the preceding year, but also on the average of the last three years. For this credit must be given to Mr. W. J. Moon, the Company's Manager, who we trust will be able to keep up to the standard he has now set for himself. Scarborough at present appears to have regained much of its pristine gaiety, the index, let us hope, of better times all round. The Lord Mayor of London in all his awful majesty, has favoured the Spa with his presence, and after this it would be almost reasonable to doubt that Scarborough will flourish henceforth as it has never done before.

The communication "On the Use of the Radiometer as a "Photometer," by Professor Pedler, F.C.S., of Calcutta—which the kindness of Dr. Frankland enables us to publish in another part of the present number of the JOURNAL—is the best exposition which has yet appeared of the exact relations of Professor Crookes's discovery to the modern practice of photometry. We need not repeat in detail the great expectations which were formed at one time, with much apparent reason, respecting the possible value, as a means of measuring light, of an instrument which was supposed to be moved by the action of light itself, and whose rate of motion seemed to depend directly and solely on the intensity of the light to which it was exposed. In this discovery of a motive power in light the germ of the most perfect of all possible photometers seemed to lie, only waiting the slight additions necessary to embody the principle in a workable form. But it is now evident, from Professor Pedler's account of his experiments in this direction, that there are causes of disturbance and error in the radiometer itself and in the conditions under which it must be used as a working implement, which render its indications too irregular to be trusted as a measure of light. The effect of temperature on the extremely rare medium which fills the radiometer-bulb is shown by Professor Pedler to be almost as abnormal as the functions of the instrument itself, and it would be impossible to rely, however tentatively, upon the indications of any particular radiometer until the constants due to its own structural peculiarities had been determined, with some accuracy, by long and difficult experiment. The net result of Professor Pedler's labours, which were most carefully directed to the avoidance of all prejudice or preventable error, seems to be that when the peculiar requirements of a radiometer-photometer are most scrupulously observed, its records are at best only to be taken as approximately correct, when compared with the candle-photometer. Such a conclusion must be held as entirely con-

demnatory of the apparatus in question. We know that the ordinary photometrical method gives results only approximately true, and what is wanted in its place is not another method of similarly incomplete character, but one which shall be positive, and free from the risk of error which must always be present when the personality of the observer plays such an important part in the determination of the result, as it does in the present system. The radiometer appeared to offer a possibility of immunity from this personal element, and if this could have been secured without counterbalancing dangers a great advance would have been made in the exact measurement of the power of light. But we must now cease to expect that this desirable end will be attained by the agency of the radiometer, for although it is perfectly mechanical in its action, it has been shown to possess a multiplicity of defects, apparently inherent and insurmountable, which render its use as a photometer chimerical.

In the Chemical Section of the British Association, at present in session at Swansea, the most important paper connected with the gas industry yet read is the "Report on the "Best Means for the Development of Light from Coal Gas "of Different Qualities—by a Committee consisting of Dr. William Wallace (Secretary), Professor Dittmar, and Mr. John Pattinson, F.C.S., F.I.C.—drawn up by Mr. Pattinson." This, which is the second report of the Committee appointed to inquire into the subject, was read on Thursday. The report deals with the best methods of burning common gas, averaging from 14 to 16 candles in illuminating power. The experiments show that, with union-jet and batsawing burners supplied with 16-candle gas, as the pressure is increased the illuminating power of the flame improves up to a certain point, and then declines, per unit volume of gas consumed. In the case of each burner there is a particular consumption and a particular pressure which give the best results. Experiments on heating coal gas before it is brought to the burner show that but little effect is produced when the gas is raised to 350° Fahr. before issuing from the orifice. When the air-supply is heated to 520° Fahr. and this hot air is brought into the bottom of an Argand burner closed against other air supply, the illuminating power of the flame was increased from 16 to 17½ candles. The increase of light would not, however, compensate for the extra cost of plant and fuel. The various devices for regulating the gas supply issuing from the burner were tested, the results being given in tabular form. We shall next week print the report, *in extenso*, together with the tables which accompany it.

The presiding magistrate at the Lambeth Police Court, Mr. Ellison, recently had before him a case of alleged conspiracy to defraud the South Metropolitan Gas Company, which presents features that we are glad to think are unusual. The defendants, four in number, who may be described as a gas consumer, the consumer's father, his business manager, and a gas-fitter, were charged with conspiring to enable the consumer to obtain gas without payment, by tampering with the meter. It was stated that the tempter, who suggested the fraud, was the gas-fitter—Joseph Horton—who, it is scarcely necessary to state, was a workman in search of a job, and apparently not particular as to the nature of his work, from the point of view of abstract morality, so long as it was sufficiently profitable. He appears to have approached, in the first case, the defendant Carman, the elder, who keeps a public-house in the neighbourhood of the Haymarket, with the offer to save him a great deal of gas, if he used a wet meter. Carman, however, was unable to profit by the gas-fitter's arts, as his own meter was a dry one; but he recommended him to his son, who is a billiard-table keeper in the New Kent Road, and whose meter was of the species available. Here the operation in question—which consisted in piercing a small hole in the drum of the meter, through the plug-hole for the discharge of superfluous water, and thus providing a passage for a certain quantity of gas without registration—was alleged to have been effected by the defendant Horton, for a consideration to be paid by the elder Carman, of course with the knowledge and connivance of the other defendants, who were on the premises when the act was committed. Thus far extends the evidence of the plumber's labourer, who was a party to the whole affair, but who eventually, in consequence of some dispute, went into the witness-box against them. The man Horton failed to pierce the drum of the meter, if such had been his intention, but as stated by the Company's Inspector (Mr. Charles Howard), the guard plate immediately in front of the drum had been perforated in two places, by some means other than could have been adopted with the object of making any possible repairs, or under any other

lawful pretence; although it was not clear that gas had been actually abstracted. On the evidence before him, the magistrate committed the defendants for trial at the next Surrey Sessions, admitting the Carmans and Phillips to bail in their own recognizances, while severer conditions were imposed upon Horton. The case being, therefore, *sub judice*, we can make no further comment on it than to repeat that it is of uncommon character, and is not likely to form the commencement of a series of attempts on the internal mechanism of meters, for, as shown by the evidence, the alleged intention to defraud was unsuccessful, and from the conditions of the case could not well be otherwise than a failure; while if it had succeeded discovery must ultimately have been certain.

A quarterly meeting of members of the Manchester District Institution of Gas Engineers, held at Halifax on Saturday last, was well attended, and the proceedings were very interesting. The members and their friends were met at the Corporation Gas-Works by Mr. Carr, the President, who conducted them over the establishment, which is managed by him with so much of credit to himself and advantage to the town. The works present a remarkable example of a difficult site turned to good account, the shape of the ground being most peculiar, while the differences in level that mark its section are somewhat extraordinary, and although not altogether objectionable for some reasons, the expenditure of capital necessitated in order to adapt them to useful purposes has been very heavy. Under Mr. Carr's direction the works have lately been much extended and brought up to the standard of modern requirements, the new buildings and apparatus being very substantial and commodious. Before leaving the works the members were entertained at luncheon, served in the new purifying-house, wherein six purifiers were in use at the time, a circumstance which it may be regretted that Dr. Ballard, the chronicler of gas manufacturing nuisances, was not present to take a note of. Among the invited guests was the Chairman of the Gas Committee of the Corporation (Alderman Riley), who bore testimony to the flourishing state of the gas affairs of the town, and intimated that a gratifying change in the administration of the finances, leading to a substantial reduction in the price of gas, might shortly be looked for. The business of reading papers, with the usual discussions thereon, subsequently occupied the members, the chief interest centring in a communication by Mr. Eastwood, of Batley, on "Coal Seams," which was of more than local importance. This, with the other papers read, will appear in our columns in due course.

Mr. D. M. Nelson's paper on "Gas Purification by Oxide of Iron," read at the last meeting of the North British Association of Gas Managers, was admirably adapted to the purpose for which it was intended—to explain in detail the use of this purifying material to a body of practical men, to whom the process is somewhat unfamiliar. It seems a trifle late in the day to enter into an advocacy of a material which has so thoroughly established itself in all large gas-works as oxide of iron. It may, indeed, be styled a gas manager's friend, since its use as a purifying agent is so easy and free from annoyance. Its chief drawback is that it cannot do certain things which are, in most important establishments, considered necessary; but beyond this, nothing can be urged to its detriment. In large works it is, as we have said, a reliable and much-valued agent, while in small country works, although the need for its employment may not be so imperative, it is difficult to see how it can fail to give satisfactory results when properly used.

Mr. F. T. Linton's communication on "The Cost of Working a Gas-Engine" was a valuable record of facts compiled by one who had special facilities for observing them, and skill to compile them in an acceptable form. The advantage shown in favour of the gas-engine as compared with a steam-engine of equal power is very remarkable, and the data on which the comparison is made can scarcely be questioned on grounds of partiality for the former. A possible saving of nearly £27 per annum in regard to gas over steam for the production of $3\frac{1}{2}$ horse-power nominal, is not likely to be overlooked by the users of power in a small way, a class of the trading and manufacturing community that tends to grow larger every year. It is needless to say that this economy is principally effected in the item of wages for attendance, in which the gas-engine possesses advantages greater even than can be valued in money. And when to this is added the many other valuable points to the credit of the gas-engine, such as its greater immunity from risk of fire and explosion, and the absence of dirt and smoke—all capable of appraisement in actual cash—a case is made out for it beyond the power of steam to rival.

Water and Sanitary Notes.

THE Metropolitan Water Examiner, Lieut.-Col. Frank Bolton, has been extending his inspectorship to the tanks, cisterns, and water-butts of the private consumers, and has found them in many cases to be in a state which suggests a scathing satire on the doctrines and teachings of the water purists. While these are "straining at gnats," the poor of London—and some of the rich—are "swallowing camels." Dr. Frankland has seen "moving organisms" in the water drawn from a stand-pipe; but Lieut.-Col. Bolton has looked into the house tanks and seen old rags, dirty rubbish, rotten lids, garbage, "dead puppies and kittens, with an occasional cat." To "make clean the outside of the cup and platter" is an old delusion. So with the water inspection of the Metropolis. The big reservoirs must be kept scrupulously clean; but the innumerable little ones may be as foul and filthy as neglect and mismanagement can make them. If water as drawn from the mains can occasionally kill, what must be the slaughter that proceeds from the cisterns?

That portion of the undertaking of the Barnet District Gas and Water Company which relates to the supply of water, appears to be entering on a prosperous phase. The capital outlay of the Company has been large, owing to the scattered nature of the district; but the rental is now increasing, and there is an ample supply of water for disposal to meet the requirements of future customers. The water rents during the past half year amounted to £3083, leaving a balance to profit and loss account of £1500 net revenue. The capital expended on the water-works is £73,000. Mr. James Glaisher, F.R.S., the Deputy-Chairman of the Company, stated at the half-yearly meeting held last week, that they were not sending out one-third the quantity of water they could distribute, and they had been duplicating their machinery, so that if part should get out of order, the other would keep up the supply of the district.

The Padiham Local Board appear to be giving to their district a supply of water which is not all that could be desired. One of the consumers having repeatedly complained, and having been told from time to time that the Board would take steps to purify the water and increase the supply, has at last placed the matter in the hands of his solicitors, with an intimation that he will not submit to be supplied any longer with water "offensive and bad," as that which he is at present doomed to receive. He wishes to know "what the Board purpose doing." The Board have resolved to reply that they are "doing what they can." A long report addressed to the Board by their Water-Works Managers states: "The hot weather of the present month has caused 'the water to have the usual offensive smell.' A number of service-pipes have been stopped up with moss derived from the bed of the reservoir, in addition to which there is an evident risk of the total supply falling short. 'The water-works were constructed in 1854,' says the Manager, 'and 'the area of the gathering-ground remains the same.' Certain 'negotiations' are going on, which it is hoped will make things better. An application is to be made to Sir Ughtred Kay-Shuttleworth for permission to lay down some pipes on his property, and as Sir Ughtred has shown great interest in the Water Supply of London, we presume he will do his best for Padiham.

The people of Moorside and its neighbourhood, in the vicinity of Oldham, were complaining bitterly some time ago of the "really awful condition" of their water supply, but have lately been delivered from all trouble and anxiety in this respect by the effectual filtration of the liquid. The population is small, numbering only about two thousand, and the filter employed at the works is capable of purifying as much as four thousand gallons of water an hour. The filter is known as Bell's patent, and the Moorside people appear thoroughly satisfied with its operation. It is reported that the patentees are putting down a large filter of this description at Pilkington, and should the system prove effectual in that instance, it is expected that it will be extensively adopted. A suggestion is put forth that the Oldham Corporation might confer a benefit on the water consumers of their jurisdiction by inquiring into the merits of this new device.

The inhabitants of Fulwood, a district lying outside Preston, complain of the charges levied upon them by the Preston Corporation in respect to their water supply. The Corporation are accused of having a "spite" against Fulwood, because it recently refused to be absorbed into the borough. As a measure of defence, the Fulwood Local Board have prepared a scheme for an independent water supply, under the advice of the well-known geologist, Mr. De Rance. At a public meeting held the other day at Fulwood,

the conduct of the Preston authorities was keenly discussed, but before taking steps to obtain an independent supply, it was resolved to send a deputation to wait on the Corporation, in the hope of settling the question amicably.

The proceedings of the Lower Thames Valley Main Sewerage Board continue to cause anxiety to the ratepayers of the district. A few days ago it was discovered that a Bill called the "Local Government Provisional Orders (Bethesda, &c.) " Bill," which contained a Provisional Order granted to the Thames Valley Board by the Central Authority, was down for a second reading in the House of Lords, and that Lord Colchester would move the insertion of a clause whereby the Local Government Board would be enabled to authorize the payment by the Thames Valley Board out of the rates of the £7000 or £8000 expenses incurred in the attempt to carry the Bill promoted in Parliament last year by the latter body. Lord Colchester's motion was, in fact, nothing less than an attempt to get the House of Lords to reverse a decision of the Master of the Rolls, who had decided that the payment of the costs out of the rates would be illegal. A deputation from the Kingston Town Council to Lord Redesdale was hastily formed on the very day when the second reading of the Bill was to take place. Lord Redesdale was seen, a petition was presented, and in the end Lord Colchester withdrew the motion of which he had given notice, saying, in doing so, that he was not aware the clause would meet with any opposition. In the House of Commons questions have been asked as to the report of the Inspector who conducted the protracted inquiry into the Molesey scheme. Mr. Brodric wished to know from the President of the Local Government Board what conclusion had been arrived at, and also why it was that the report had not been made public. Mr. Warton went a step farther, and asked whether the report of the Inspector, after forty-five days spent in receiving evidence, was not condemnatory of the scheme which had been brought forward. Mr. Dodson, in his reply, signified that the time had not arrived for answering these interrogations. Three days afterwards, Mr. Brodric asked for a guarantee that the decision of the Local Government Board would be announced at a time when the attention of Parliament might be called to it. The honourable member was then told that as nothing could be done without a Provisional Order, the House would have ample opportunity for discussing the subject. In the course of his replies, Mr. Dodson said it had been found necessary to refer the report back to the Inspector "for further explanation." This statement has created some apprehension that private influence is being brought to bear in favour of Colonel Haywood's scheme. A local contemporary, in discussing the subject, says: "It is not, we fear, improbable that the public may be startled with a scandal in social legislation." It is stated that the recent inquiry conducted by Mr. Harrison will cost the ratepayers £20,000.

The Banbury sewage farm does not appear to effect all that is required for the benefit of the Cherwell. Several farmers and others, resident on the banks of the river for some miles below the town, have sent a memorial to the Local Board of Health, stating that during the last two months the Cherwell has been "in a most offensive condition," and that "large quantities of fish have been destroyed by the sewage matter that has come down from Banbury." Some years ago the Banbury authorities were subject to legal proceedings on account of the discharge of sewage into the river, and matters went so far that the town property was very nearly becoming sequestered. The establishment of the sewage farm followed, and for some time it answered admirably. Possibly the heavy and frequent rains of the past summer so saturated the soil as to render the application of the sewage somewhat difficult. If so, a good precipitation process would have been found valuable as an adjunct. Complaints are also rife in respect to the Medway, where it is said thousands of fish have been poisoned in the course of ten days, the mischief being attributed to the discharge into the river of a noxious liquid from some paper mills. In this instance the Authorities of the district appealed to the Local Government Board to send down an Inspector to make an inquiry, and advise them how to proceed. The Board replied, asking whether it was the wish of the Authorities to proceed against the offenders under the sixth section of the Rivers Pollution Act. After considerable discussion, the Local Authorities resolved to inquire farther into the facts of the case. It appears to be the wish of the Maidstone Local Board that the parties who now pollute the stream should make use of subsidizing tanks, so that the liquid might not pollute the river. In this way, it is suggested, "expensive litigation may be avoided." The case is, apparently, one which will put the utility of the Rivers Pollution Act to a practical test.

THE ACCOUNTS OF THE METROPOLIS GAS COMPANIES FOR 1879.

WE publish to-day, according to the promise recently made, a tabular abstract of the accounts of the Metropolis Gas Companies for the past year. The process of amalgamation has in some measure affected the symmetry of the statement, especially as regards the value of the evidence it gives respecting the working results of the amalgamated Companies as compared with those of the previous year. This is, however, a consideration of small moment, the value of the record as it really exists being plain.

From it we gather that the amount of capital and borrowed money involved in the great work of supplying gas to the whole of the Metropolis reached the grand total of £12,681,818, the employment of which at the remunerative rates of interest which it has yielded for many years past, in this particular industry, is perhaps one of the most striking illustrations of the peculiar conditions of modern social existence.

The detailed statistics of the working of the five Companies are worth some attention. The first thing noticeable on comparing the table wherein the various items of account are reduced to the unit of coal carbonized, with the similar table for the previous year, is that the capital and borrowed money of all the Companies is less, the decrease ranging from nearly 20s. per ton in the case of the London Company to about 1s. 9d. only as with the late Phoenix Company. The capital and working statements of the South Metropolitan Company, including as they do six months independent working of the Survey Consumers Company, can hardly be compared with earlier returns, compiled when the two Companies were distinct. The income of all the Companies, except the South Metropolitan, was less last year, on the same basis of comparison, than in the year previous; and the same may be said of the expenditure on revenue account. The gross profit per ton of coal for the year was—Chartered, 13s. 1-14d.; Commercial, 11s. 3-19d.; London, 9s. 5-6d.; Phoenix, 12s. 1-99d.; South Metropolitan, 11s. 10-36d.; mean of the whole, 12s. 5-28d., which is 4-23d. less than the average of the year before—a result which must be considered remarkably even for two years operations of such magnitude, and depending on factors which are all of them more or less variable.

Glancing through the figures representing the total increase or decrease of the Companies business under the chief heads of income and expenditure, we find, of course, a general increase in the sales of gas by meter, the most striking comparison between the two years being in the case of the London Company, which last year had an increase of £23,281 as against £710 increase in 1878. The decrease in the amount realized for residuals, which was such a striking feature of the returns for 1878, gave place last year to an increase of £44,211, which was more than double the amount required to make up for the previous year's deficiency. In the case of the Chartered Company the increase, curiously enough, was within a few pounds of the previously recorded decrease.

Statistics, we are frequently told, can be made to prove anything, and in the table before us there is much to exercise the ingenuity of any one who may wish to pick a hole in the management of any of the Companies represented. But our readers do not require to be reminded that comparative statements of working results, such as the one in question, however interesting in themselves, are qualified to assist an inquirer into the position of the undertakings concerned only up to a certain point, beyond which other factors, impossible to tabulate, must be taken into account. In some things it is indeed possible to compare the operations of different works, or groups of works, with something like strict and sole reference to general principles, such, for example, as the results given in the following table, which shows, in the most concise form, what has been done in the retort-houses of the different Companies during the past year:—

TABLE of the Residuals and Gas made, per Ton of Coals Carbonized, by the Metropolis Gas Companies in the Year 1879.

Name of Company.	Coke per Ton of Coals, in Bushels.	Breeze per Ton of Coals, in Bushels.	Tar per Ton of Coals, in Gallons.	Ammoniacal Liquor per Ton of Coals, in Gallons.	Gas Made. Feet per Ton
CHARTERED	41-95	3-61	10-84	32-93	10,139
COMMERCIAL	46-14	4-11	9-08	32-81	10,191
LONDON	35-07	4-26	9-87	25-74	9,904
PHOENIX	36-00	2-14	10-16	28-59	10,089
SOUTH METROPOLITAN	45-00	2-74	10-48	25-61	9,888
Mean per ton . . .	41-43	3-48	10-52	31-16	10,088

The whole of the Companies, with the exception of the late

ACCOUNTS OF THE METROPOLIS GAS COMPANIES FOR THE YEAR 1879.

	Chartered.		Commercial.		London.		Phoenix.		South Metropolitan.		All the Companies.	
	£	s. d.	£	s. d.	£	s. d.	£	s. d.	£	s. d.	£	s. d.
Capital and borrowed money	9,096,771	1 4	690,000	0 0	860,359	15 0	1,208,000	0 0	826,688	0 0	12,081,818	16 4
Income—viz.:												
Sale of gas by meter	1,905,743	5 1	212,330	17 7	216,039	7 2	269,379	7 5	234,574	9 4	2,838,117	6 7
Public lights, including lighting and contracts	128,365	18 8	20,095	11 11	20,206	11 1	26,117	8 3	28,580	8 0	223,956	2 11
Meter-rents	86,485	15 8	4,221	13 10	4,391	12 11	6,129	2 4	5,466	1 0	56,694	5 9
Old materials	4,656	9 4	172	11 4	627	14 9	3,577	19 3	264	5 6	7,292	0 2
Residual products	496,078	14 6	62,684	5 11	68,041	19 2	75,295	1 11	80,623	3 9	789,323	5 3
Miscellaneous	5,415	5 2	305	8 7	2,701	13 0	2,495	4 4	461	15 7	11,379	6 8
Total income from all sources	2,977,355	8 5	300,460	9 2	312,000	3 1	380,994	3 6	355,970	3 2	3,920,769	7 4
Expenditure—viz.:												
Coals, including carriage and dues	929,181	18 10	117,365	12 10	110,902	15 7	130,737	7 7	125,638	9 7	1,413,826	8 5
Purifying materials, including labour	57,175	18 0	7,969	13 7	7,482	2 8	8,273	5 10	6,866	8 10	79,097	8 11
Salaries and wages—manufacture	181,643	18 10	28,151	7 4	29,504	2 9	29,504	10 6	34,259	5 10	201,900	8 9
Wear and tear—manufacture	380,151	7 4	19,747	14 11	43,511	14 8	48,167	17 6	54,519	18 6	422,065	12 6
Rents, rates and taxes	77,501	5 4	7,701	19 5	9,350	6 2	10,881	14 11	8,564	17 6	114,000	3 4
Salaries—management	12,041	4 1	1,336	0 0	2,559	8 8	2,476	8 11	5,945	9 4	23,696	4 4
Collectors commission	23,689	3 3	2,322	13 5	3,359	7 6	5,055	3 3	3,734	7 4	38,160	14 9
Stationery, printing, and general charges	9,591	7 5	1,857	18 3	2,026	14 0	2,443	12 0	2,975	9 5	18,895	1 1
Directors	7,500	0 0	3,396	0 0	2,500	0 0	3,000	0 0	11,355	14 0	27,552	14 0
Auditors	500	0 0	150	0 0	150	0 0	200	0 0	237	16 0	1,237	10 0
Salaries and wages, wear and tear—distribution	138,249	18 11*	21,371	19 0	26,178	11 3	23,175	10 2	18,874	16 8	227,850	16 0
Repair and renewal of meters	32,455	14 5	2,169	14 1	3,865	5 1	5,346	14 4	2,841	11 8	46,678	19 10
Law and parliamentary charges	3,267	0 0	921	14 9	1,402	8 2	1,402	8 2	1,402	8 2	6,471	10 0
Bad debts and extraordinary expenses	36,920	4 1	1,974	0 10	2,324	19 4	2,971	16 10	3,638	19 6	41,230	6 7
Total expenditure on revenue account	1,789,839	40 6	217,111	19 3	238,807	18 8	269,287	0 3	248,555	15 8	2,763,692	4 4
Gross profit	787,495	17 11	83,348	9 11	73,111	4 5	111,707	3 3	107,414	7 6	1,167,077	3 0
Do. per cent. on capital and borrowed money	8 13 2		12 1 7		8 9 11		9 4 11		12 10 10		9 3 5	
Do. do. gas-rental	28 14 3		35 15 2		30 18 11		37 16 1		40 16 4		37 19 8	

* This item includes the sum of £1369 2s. 10d. for experimental street lighting, and £415 7s. 8d. for experiments with the electric light.
† Including half year's independent working of the late Surrey Consumers Company, January to June, 1879.

TABLE showing the Capital, Income, Expenditure, and Profit per Ton of Coal carbonised in 1879.

	Chartered.		Commercial.		London.		Phoenix.		South Metropolitan.		Mean of all the Companies.	
	£	s. d.	£	s. d.	£	s. d.	£	s. d.	£	s. d.	£	s. d.
Capital and borrowed money	7 11	3 16	4 13	3 18	5 11	4 78	6 11	6 77	4 11	3 65	6 9	2 67
Income—viz.:												
Total gas-rental	1 13	9 88	1 11	6 05	1 10	7 07	1 12	2 20	1 9	0 77	1 12	9 01
Public lights	7 28		6 85		6 82		8 01		7 25		7 28	
Meter-rents	0 03		0 28		0 28		2 06		0 35		0 35	
Old materials	8	3 11	8	5 67	8	9 72	8	2 40	9	6 80	8	5 21
Residual products	1 46		0 49		0 40		3 26		0 61		1 08	
Miscellaneous	2	2 10 28	2	0 7 34	2	0 4 79	2	1 5 93	1	10 3 78	2	1 11 99
Total income from all sources	2	2 10 28	2	0 7 34	2	0 4 79	2	1 5 93	1	10 3 78	2	1 11 99
Expenditure—viz.:												
Coals, including carriage and dues	15	5 41	15	10 37	14	4 32	14	2 87	13	10 52	15	1 46
Purifying materials, including labour	11 41		11 86		6 65		5 59		9 10		10 23	
Salaries and wages—manufacture	3	0 24	3	11 83	3	5 96	3	2 57	3	9 40	3	2 75
Wear and tear—manufacture	4	9 09	2	8 03	5	7 61	5	2 96	2	8 50	4	6 17
Rents, rates, and taxes	1	0 49	1	0 49	1	2 53	1	2 23	1	11 35	1	2 63
Salaries—management	2	40	2	48	4	03	3	24	2	6 08	3	0 04
Collectors commission	4	73	3	77	5	22	6	61	4	95	4	90
Stationery, printing, and general charges	2	0 10	2	10 59	3	16	3	20	3	3 54	2	42
Directors	1	50	1	50	3	88	3	23	1	3 05	3	53
Auditors	0	10	0	24	0	23	0	27	0	0 84	0	16
Salaries and wages, wear and tear—distribution	2	0 59	2	10 59	3	16	3	20	2	1 02	2	5 34
Repair and renewal of meters	6	48	3	52	6	01	6	99	3	7 77	5	92
Law and parliamentary charges	0	65	1	49	1	32	1	38	0	7 77	0	65
Bad debts and extraordinary expenses	6	17	3	21	3	61	3	89	4	03	5	29
Total expenditure on revenue account	1	9 9 14	1	9 4 15	1	10 11 19	1	9 3 94	1	7 5 42	1	9 6 71
Gross profit	13	1 14	11	3 19	9	5 60	12	3 99	11	10 36	12	5 28

TABLE showing Increase or Decrease in each Item during 1879 compared with 1878.

	Chartered.		Commercial.		London.		Phoenix.		South Metropolitan.		All the Companies.	
	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.
Capital and borrowed money	£ 370,271	£ ..	£ ..	£ ..	£ ..	£ 3,654	£ 46,000	£ ..	£ 36,688	£ ..	£ 449,305	£ ..
Income—viz.:												
Sale of gas by meter	131,093	..	13,623	..	23,281	..	17,070	..	19,162	..	204,229	1,020
Public lights, including lighting and contracts	372	..	63	..	168	..	106	..	16	2,185	1,590	..
Meter-rents	1,177	..	156	..	293	..	84	..	180	..	44,311	13
Old materials	26,899	..	5,325	..	6,833	..	2,155	..	9,108	..	44,311	1,730
Residual products	324	..	530	..	468	..	136	..	281	..	1,730	..
Miscellaneous . . . . .	..	..	..	..	..	..	..	..	..	..	..	..
Total income from all sources	158,587	..	16,731	..	30,836	..	15,468	..	25,640	..	247,261	..
Expenditure—viz.:												
Coals, including carriage and dues	65,148	..	3,586	..	6,553	..	3,227	..	5,185	..	84,890	..
Purifying materials, including labour	6,147	..	217	..	1,731	..	927	..	596	..	9,613	..
Salaries and wages—manufacture	6,882	..	1,362	..	2,639	..	693	..	1,151	..	12,729	..
Wear and tear—manufacture	12,940	..	1,679	..	17,656	..	1,910	..	1,150	..	35,515	..
Rents, rates, and taxes	3,416	..	1,327	..	1,324	..	636	..	427	..	2,833	3,211
Salaries—management	549	..	21	..	137	..	20	2,197	..	2,833	3,211	
Collectors commission	382	..	183	..	251	..	420	..	233	..	1,420	..
Stationery, printing, and general charges	1,722	..	108	..	267	..	49	..	735	..	7,635	513
Directors . . . . .	..	..	..	..	..	..	..	..	7,685	..	7,685	513
Auditors . . . . .	..	..	..	..	..	..	..	..	52	..	52	..
Salaries and wages, wear and tear—distribution	10,353	..	5,491	..	8,605	..	507	..	1,691	..	26,652	..
Repair and renewal of meters	3,382	..	450	..	809	..	946	..	326	71	5,715	..
Law and parliamentary charges	2,574	..	540	..	298	..	397	..	526	..	1,694	..
Bad debts and extraordinary expenses	2,574	..	241	..	4,607	..	298	..	213	..	2,194	..
Total expenditure on revenue account	102,787	..	14,731	..	32,405	..	11,182	..	20,485	..	151,592	..
Gross profit	55,800	..	2,000	..	1,569	..	4,286	..	5,155	..	65,669	..
Do. per cent. on capital and borrowed money	0 28	..	0 29	..	0 15	..	0 08	..	12 46	..	0 19	..
Do. do. gas-rental	0 27	..	1 34	..	4 24	..	0 96	..	40 38	..	0 40	..

Phoenix Company, show a higher yield of coke per ton of coal carbonized than in 1878; the increase in the case of the Chartered Company being over 8 bushels. They also obtained more tar and ammoniacal liquor, but slightly less gas. In 1878 the Chartered Company headed the list as regards the make of gas per ton of coal; but last year the Commercial Company took precedence in this respect, though only by a small quantity. The South Metropolitan Company still as to quantity kept their place at the bottom of the list, the difference between the highest and the lowest being, however, little over 300 feet per ton.

In all respects, as we have already stated, the clear results of the two years working are remarkably close, and on the whole the past year must be acknowledged to have been a prosperous one for all the Metropolitan Gas Companies.

Communicated Articles.

ON THE AMOUNT OF LIGHT NAPHTHA IN COAL TAR, AND ITS PRACTICAL ILLUMINATIVE VALUE TO THE GAS MANUFACTURER.

By MR. H. LEICESTER GREVILLE, F.C.S., &c.,
Chemist to the Commercial Gas Company.

Much has been written, and a considerable amount of discussion has taken place at one time and another, on the subject of the light naphthas produced during the manufacture of coal gas, and on the value to the gas maker of retaining them as far as possible in the gas, in place of allowing them to be, in great measure, retained by the tar. With such a degree of interest evidently attaching to the question, it is surprising to find that few, if any, experiments have been made on the principal points most bearing on the subject. Assuming that it is desirable to utilize all the light hydrocarbons produced in gas manufacture, in order to develop the greatest possible light in the gas, there are two points which require special attention, and upon which the whole question rests. These points are: First, what is the available amount of these light naphthas which the ordinary gas manufacturer has at his disposal to increase the illuminative value of his gas; and, secondly, what is the absolute increase in lighting power obtainable from the expenditure of a certain quantity of light naphtha. On the first point, I do not remember having seen any published information, and on the second point there existed, I believe, a similar lack of information, when the *resumé*, by Mr. G. E. Stevenson, of Dr. Knublauch's experiments was given in the last number of the JOURNAL. These experiments record the illuminative value of benzol, which may be taken as the principal constituent of coal tar naphtha, while my own experiments in this branch of the subject (which I may here state were completed before the publication of Mr. Stevenson's paper, and in complete ignorance of Dr. Knublauch's results) were purposely conducted on the crude naphtha, in order to have as exact an analogy as possible between my experimental data and the practical operations of the gas maker.

When my attention was first directed some time back to the subject of the Aitken and Young process of gas-making, I was desirous of placing myself in a position to form a reliable opinion on the value of a method from the use of which such valuable results are claimed. In the first place, there is one point in the various discussions which have taken place on the subject, which I cannot help thinking has been somewhat overlooked—viz., that the practical value of any process, the object of which is to transfer light hydrocarbons from the tar to the gas, is represented, not by the gain to the gas alone, which appears to be the general view taken, but by the balance of the difference between the increased value of the gas on the one hand and the diminished value of the tar on the other. Robbing the tar of its light naphtha means broadly, that the tar distiller would be deprived of the special product which gives the tar its principal value—viz., the benzol, which is the source of the aniline colours of commerce. It is indeed an open question—in the event of any process being adopted by a large number of gas companies which deprived the tar of its light hydrocarbons—whether the consequent increasing scarcity of benzol would not so augment the commercial value of naphtha-laden tars as to make it more remunerative for the gas manufacturer to gain any desired increase of lighting power by the use of extra canal, and dispose of the produced tars with their full complement of naphtha, and consequently of benzol. However speculative such views may seem at present, it may be at least anticipated that the extensive adoption of any process which deprives commercial tar of its benzol, would rapidly lead to an augmentation in the value of the last-named substance, producing a corresponding increase in the value of any such source of benzol as naphtha-laden tars.

Having called attention to this point, which is certainly worthy of serious consideration, it remains to record the results of the experiments which I have made with reference, firstly, to the amount of light naphthas which are available for transfer from the tar to the gas, at an ordinary works where common coal is used with a small percentage of canal; and, secondly, as to the illuminative value of such naphtha when so transferred to the gas. Whilst making experiments on the first point, I thought it would be advisable, in the absence of all data on the subject, to make an examination of the different tars deposited at all available points in the condensing and purifying plant, with reference to the amount of light naphtha which they contained, in addition to making a series of determinations of the percentages of light naphtha in the stock tars as sold

from the works. These last-named samples, of course, represent the mean of all the various tars produced at the different portions of the plant. With this view I obtained various samples from three different works. The samples represent tar drawn from the following points:—The hydraulic main; the end of the circuitous length of pipe proceeding from the hydraulic, and along which the tar condensed in the hydraulic flows; the condensers; the washers; and one sample from a scrubber in which the coke had remained for some time without being changed.

The following table shows the results obtained, and in addition the percentage of light naphtha in the stock tars, as representing the ordinary commercial product as it leaves the works:—

	Where from.	Specific Gravity of the Tar.	Percentage by Volume of Light Naphtha.	Specific Gravity of the Crude Naphtha.
No. 1 Works.	Hydraulic main	1.220	Mere trace.	—
	End of pipe connection with hydraulic	1.220	1.2	.961
	Condensers	1.143	7.6	.910
	Do.	—	6.6	.908
	Washers	1.137	13.0	.912
	Do.	—	13.5	.904
No. 2 Works.	Stock	1.217	2.7	—
	Do.	—	3.2	.901
	Condensers	1.183	9.5	.954
	Washers	1.142	7.3	.923
	Stock	1.223	1.1	.939
	Do.	1.225	1.6	.961
No. 3 Works.	Do.	—	2.0	.922
	Do.	—	0.8	—
	Do.	—	1.0	—
	Do.	—	1.0	—
	Condensers	1.149	7.5	—
	Washers	1.109	13.0	—
No. 4 Works.	Do.	—	9.3	—
	Scrubber	1.103	9.3	—
	Stock	1.210	2.5	—
	Do.	1.203	2.1	—

The following table places the figures more concisely, giving the average when more than one sample was tested:—

Where from.	Specific Gravity of the Tar.	Percentage by Volume of Light Naphtha.	Specific Gravity of the Crude Naphtha.
Hydraulic Main	1.220	Mere trace.	—
Hydraulic extension	1.220	1.2	.961
Condensers	1.160	6.3	.924
Washers.	1.129	11.2	.913
Scrubber	1.103	9.3	—
Stock	1.215*	2.6*	.930

* These figures are the mean of the samples from works Nos. 1 and 3. I have omitted the samples from work No. 2 for reasons which will be explained further on.

With reference to the figures in the table, it will be noticed that as the samples of tar are taken at increasing distances from the retort, the specific gravity becomes less, and the percentage of light naphtha more—the specimen from the scrubber alone excepted. The fluidity of the specimens was also greater as the amount of light naphtha increased. The specimen of tar from the hydraulic main was so thick when cold that it would scarcely pour from the containing vessel, while the samples which gave 13 per cent. of naphtha were as fluid as black varnish. The high specific gravity of the naphthas as compared with benzol was due to their containing a large quantity of naphthaline. One point deserving special attention is that the tar from the hydraulic main contained no appreciable quantity of light naphtha, while the same tar, after flowing along with the gas through some 350 feet of horizontal main attached to the side of the retort-house, contained 1.2 per cent. This result may be considered either as due to the prolonged contact of the tar with the gas, or may be an effect simply due to condensation, the temperature at the outlet of the hydraulic main being 130°, and at the end of the 350 feet length of main 104°. The absence of any estimable quantity of light naphtha in the hydraulic main tar seems also to show that at the temperature there found (130°), and under the ordinary conditions of gas manufacture, naphtha is neither condensed nor is it absorbed by the tar. In the event of any process by which it is proposed to transfer the light naphthas from the tar to the gas, it would seem by far the better plan to allow the tar condensed in the hydraulic main to flow directly away to a special receptacle, and to collect apart the tars subsequently condensed in the remaining portions of the plant, and which are comparatively rich in light hydrocarbons, for subsequent treatment in an analyzer or other apparatus suitable for effecting their transfer to the gas. This plan would minimize the expense of the requisite apparatus, inasmuch as a comparatively small quantity of tar would have to be dealt with, and a correspondingly small apparatus employed.

At works No. 2 the plan has been adopted of drawing off the tar direct from the hydraulic main, under the impression that the diminished contact of the tar with the gas would tend to the retention of light hydrocarbons by the latter. It is in consequence of this treatment that I have omitted the samples of the stock tars in giving the mean percentage of light naphtha in the second table. On reference to the actual figures showing the percentages of naphtha in the stock tars from works No. 2, it will be seen that the amounts are less than those shown in the examination of the other samples

from works Nos. 1 and 3. Whether this arises from the withdrawal of the tar at the end of the hydraulic main, or from other causes, I am not prepared to say, but I may state that a general impression prevails at the works that the illuminating power of the gas has been greater since the adoption of the new plan.

With regard to the remaining figures in the table, the only facts worthy of note appear to be that samples of tar were met with containing as high an amount as 13 per cent. of light naphtha, and that as much as 7·6 per cent. was found in ordinary condenser tar. As these figures were obtained from the analyses of samples taken in comparatively warm weather, it is probable that they represent minimum quantities, and that during the winter months the percentages of light hydrocarbons would be found considerably higher.

In my next article I shall endeavour to show what is the absolute light-giving value of the light hydrocarbons to the gas manufacturer when retained in the gas, the estimate being based on the percentage of naphtha found in the stock tars.

ON THE USE OF THE RADIOMETER AS A PHOTOMETER.

By Mr. ALEXANDER PEDLER, F.C.S. (London and Berlin), F.I.C., Professor of Chemistry, Presidency College, Calcutta.

In a paper "On the Mechanical Action of Light," by Mr. Crookes,* written about four years ago, and which gave a sort of summary of the results obtained with the radiometer, a few photometrical experiments with the instrument are given, and from them it is concluded that the radiometer is a perfect photometer. The author says, "By this means photometry becomes much simplified; flames the most diverse may readily be compared between themselves, or with other sources of light. A standard candle can now be defined as one which, at x inches off, causes the radiometer to perform y revolutions per minute (the values of x and y having previously been determined by comparison with some ascertained standard); and the statement that a gas-flame is equal to so many candles may, with more accuracy, be replaced by saying that it produces so many revolutions." This conclusion being of great practical importance, and as the experiments on which it was based were very few in number, it appeared to be advisable that they should be, if possible, confirmed by a more extended series of observations.

It being part of my regular work to test the illuminating power of the Calcutta gas, I made a series of observations with the radiometer, comparing it with a standard gas-flame, whilst I was at the same time determining the illuminating power by the ordinary photometric method, as prescribed by the London Gas Referees. My first results were embodied in a note read before the Asiatic Society of Bengal, and published in their Proceedings for August, 1876. The conclusions at which I arrived were not very favourable to the use of the radiometer as a photometer, and one great cause of the discrepancies of my results was apparently to be found in the friction of the instrument. In the paper referred to I say: "It will be seen that these results agree very closely with those calculated according to the law of inverse squares; that is to say, the number of revolutions of the radiometer will be inversely proportional to the square of the distance from the source of light. But it will also be noticed that there is one marked exception to the rule, and that is at a distance of 10 inches from the gas-flame, where the rapidity of revolution is great. Here the actual number of quarter revolutions amounted to 59·36 per minute, whilst theoretically they should have been 90. Evidently when the radiometer is rotating rapidly there must be an immense increase in the friction, so as to reduce the rotation by one-third of the whole amount. There are also indications that when the radiometer is rotating very slowly, there is a considerable disturbance from the theoretical rate of revolution, probably showing that friction has much influence both when the rotation is slow and rapid." My general conclusions on Mr. Crookes's proposal to use the radiometer as a photometer were summed up in the following paragraph in the same paper:—"It is, I think, evident, from these experiments, that it would be impossible to say that because a radiometer rotated 16 times as rapidly with one flame as it did with another, the former flame possessed 16 times the illuminating power of the latter; for it must be seen that in working with either a very high or a very low rate of revolution, there appears to be a considerable disturbance due to the friction of the instrument. It is, I believe, possible and even probable that much better results will be obtained by working the radiometer always to a fixed number of revolutions (say about 30 or 40 quarter revolutions per minute), and by altering the distance of the flame until such rapidity is obtained; in this way the friction of the instrument would be reduced to a constant quantity, and the comparative luminosities would be judged by the squares of the distances."

In the hope of proving the feasibility of this method of procedure, I have carried on a series of experiments with the Calcutta gas for more than two years, testing the illuminating power simultaneously by the ordinary photometric method and by the radiometer. The method of procedure was very simple. The instrument used was an ordinary radiometer with four aluminium vanes blackened on one side. The vanes rotate on a steel point, which is supported in the usual glass cup. The glass globe of the radiometer is about 6 centimètres in diameter, and it stands about 18 centimètres from the table. The radiometer was placed on a table which was graduated in centimètres, the zero point of the scale being made the centre of the radiometer. A standard Argand burner was so arranged that the centre of the flame was as nearly as possible at the same height as the vanes of the radiometer, and by means of a test meter exactly 5 cubic feet of gas per hour were burned in the jet. The burner was

then moved towards or away from the radiometer until the vanes made exactly 15 whole revolutions or 60 quarter revolutions per minute. This number was selected as being most convenient, for by having a clock in the room audibly beating seconds, it was easy to see whether the rapidity of rotation was correct or not. The radiometer having then attained a constant speed of 60 quarter revolutions per minute, the distance of the centre of the flame from the central pivot of the radiometer was noted. No extraneous light was allowed to reach the radiometer, for all other flames which were burning in the room at the time of determination were either enclosed in the photometer or their light was screened off in some similar way. At the same time, and from the same supply-pipe, the illuminating power of the gas was determined by the photometrical process adopted by the London Gas Referees. In this process the illuminating power, as is well known, is corrected both for the temperature and pressure of the gas at the time of the experiment, the standard of 80° Fahr. and 30 inches pressure being adopted. In this way a large number of values were obtained for this particular radiometer, the experiment for each day showing that a certain distance of the standard flame from the instrument was equal to an illuminating power of so many candles.

To compare each day's experiment with others, I calculated from the numbers obtained what should have been the distance of the standard light from the radiometer if the gas had possessed an illuminating power of 12 candles. The calculation is, of course, a simple one, the distances being directly proportional to the square roots of the illuminating powers. Very considerable variations were, however, found in the numbers thus calculated; but I still persevered with the experiments until I had obtained between 250 and 300 results, which I thought would be sufficient to show the causes of these variations. I did not, of course, expect to obtain a perfectly exact agreement of the results of the photometer with the radiometer, for there is no doubt that the photometric method, though much improved, still does not give absolutely reliable results. This is inherent in the method itself, and it can scarcely be said to be capable of giving results nearer than *plus* or *minus* half a candle. In the second place, the colour of a gas-flame is known to vary somewhat, being sometimes comparatively white, but generally degenerating into a very decided yellow, and Mr. Crookes* has pointed out that different coloured rays have different actions on the radiometer. At first I was inclined to ascribe the differences I obtained to the above two causes; but as my experiments multiplied, and especially as the seasons here changed from the so-called cold weather to the hot weather and rains, it appeared that another and more serious cause affected the results. It appears clearly from my experiments that at the comparatively high temperatures which obtain here during the hot-weather months, the radiometer which I have used is very much less sensitive than at lower temperatures.

In all the experiments which I have made, I have recorded the atmospheric temperature and pressure; but, so far as I can see, it is practically impossible that the slight differences of atmospheric pressure which obtain here can have any effect on the rotation of a radiometer. No attempt has, therefore, been made to connect the changes in the sensitiveness of the radiometer with changes of atmospheric pressure. The readings of temperature are, however, important, for it is clear that, with every change of temperature, there will be an alteration in the tension of the residual gas in the radiometer. It is unfortunate that, working in a comparatively small room, as I have had to do, with sometimes three or four gas-jets burning, as well as the standard candles, it has been practically impossible to keep the atmospheric temperature constant. I have usually read the thermometer immediately on making the determination with the radiometer; but as the temperature was constantly though gradually rising, the exact temperature of the experiment is a little doubtful, for the temperature of the air and of the radiometer during the actual experiments may have varied by a degree or more from the observed temperature. It is clear also that the action of the light on the radiometer will be to raise its temperature, and this will be another disturbing cause which it is impossible to overcome. To eliminate any such slight doubt as the actual temperature at which the experiments have been made in the table below. I have grouped the experiments for every five degrees (Fahrenheit) of temperature. Starting with the lowest temperature which we have here of about 66°, the first group will be from 66° to 70°, the second from 71° to 75°, the third from 76° to 80°, and so on:—

Temperature of Air at Time of Experiment. Deg. Fahr.	Number of Observations made between these Temperatures.	Calculated Distance of Standard Flame of 12-candle Power from the Radiometer in order to produce 60 Quarter Revolutions per Minute.	Differences.
66 to 70	3	54·5 centimètres.	—
71 " 75	29	51·7 " "	2·8 centimètres.
76 " 80	28	49·5 " "	2·2 " "
81 " 85	51	47·8 " "	1·7 " "
86 " 90	94	45·6 " "	4·2 " "
91 " 95	56	40·1 " "	3·5 " "
96 " 100	8	36·8 " "	3·3 " "

It will, I think, be clearly seen from these numbers that the radiometer used in these experiments is much more sensitive at low than at high temperatures. At temperatures of 71° to 75° Fahr., with 12 candle power gas, to obtain 15 rotations of the radiometer per minute, the gas-flame is placed at 51·7 centimètres distance; but with the same amount of light to obtain the same velocity of rotation at a temperature of from 96° to 100° Fahr., it is necessary to

* Quarterly Journal of Science, July, 1876.

* Proc. Roy. Soc., xiv., p. 279.

put the light as close as 36·5 centimetres, or about two-thirds of the above distance. It will also be noticed that for every rise of 5° Fahr. there is a continued and fairly steady decrease in the distance at which the light must be placed to obtain the same rapidity of rotation. The numbers from which these figures are calculated are too numerous to include in this paper; but, as examples of them, the experiments made at two temperatures may be given. These will show the extent of the variations in the observations at each temperature, and they will again clearly show that the radiometer is much more sensitive at low than at high temperatures:—

Temperature of Air at Time of Experiment (i.e., Temperature of Radiometer) = 66° Fahr.			Temperature of Air at Time of Experiment (i.e., Temperature of Radiometer) = 92° Fahr.		
Illuminating Power of Gas-Flame determined by Photo- meter, in Standard Candles.	Observed Distance from Radiometer to cause it to Revolve 15 times per Minute, in Centimetres.	Calculated Distance of Gas-Flame of 12-candle Power from Radiometer to cause 15 Revolu- tions per Minute, in Centimetres.	Illuminating Power of Gas-Flame determined by Photo- meter, in Standard Candles.	Observed Distance from Radiometer to cause it to Revolve 15 times per Minute, in Centimetres.	Calculated Distance of Gas-Flame of 12-candle Power from Radiometer to cause 15 Revolu- tions per Minute, in Centimetres.
13·00	46·4	44·6	13·63	41·2	40·2
14·44	50·2	45·8	14·07	43·8	40·4
14·40	48·8	44·6	14·13	46·1	42·5
14·00	46·2	42·8	13·51	46·4	43·7
13·78	45·5	42·6	13·48	40·2	37·9
13·60	43·7	43·9	13·37	40·2	38·1
13·44	47·4	44·6	13·23	38·6	36·8
16·18	52·4	44·1	14·36	43·2	39·4
13·37	48·8	44·4	13·66	43·0	40·2
13·29	45·9	43·6	14·75	45·2	40·9
14·29	48·2	44·1	13·30	44·5	41·4
14·07	47·2	43·6	14·28	43·2	38·7
13·74	46·2	43·3	—	—	—
12·68	45·7	44·5	—	—	—
13·16	45·6	43·6	—	—	—
13·86	45·2	42·1	—	—	—
14·10	46·2	43·6	—	—	—
14·02	48·4	44·6	—	—	—
Average distance for 12-candle power . .		43·8	Average distance for 12-candle power . .		40·0

The numbers obtained at each temperature, it is true, vary somewhat from the mean; but a comparison of the numbers obtained at the two temperatures 86° Fahr. and 92° Fahr. will, I think, leave no doubt as to the fact that the radiometer is more sensitive at low than at high temperatures.

Assuming the radiometer which had been employed in all these experiments to be representative of its class, from the experiments it is, I think, clear, that this instrument cannot be trusted as a photometer, and that it is by no means likely to supersede the ordinary photometric methods. I do not, however, mean to say that the radiometer may not in some cases be useful as a confirmative test in photometry; but even this limited use can only be made of it by the expenditure of a considerable amount of time in the determination of the constants of the particular instrument used. This effect of the diminution of the sensibility of a radiometer at higher temperatures has apparently not been previously noticed; but it is quite what might be expected. So far as can be seen, the only effect of the alterations of temperature will be to cause alterations of the tension of the residual gas in the radiometer. That such alterations will have a considerable effect on the sensitiveness of the instrument, is clearly shown by Mr. Crookes's researches. In his "Experimental Contributions to the Theory of the Radiometer," Mr. Crookes writes:—"Simultaneously with this decrease in the viscosity, the force of repulsion exerted on a black surface by a standard light varies. It increases (with air) very slowly till the exhaustion has risen to about 70 millionths of an atmosphere; at about 40 millionths the force is at its maximum, and it then sinks very rapidly till at 0·1 millionth of an atmosphere it is less than one-tenth of its maximum."

It appears clear, then, that in the radiometer used in the experiments the pressure was above 40 millionths of an atmosphere; that is, above the pressure at which radiation gives its maximum effect, for by the increase of pressure due to increase of temperature the sensitiveness of the instrument is impaired. Granting that Mr. Crookes's conclusions are correct, some radiometers, on the other hand, might become more sensitive at higher temperatures; that is, when the pressure is increased towards the point when the maximum effect from radiation could be obtained. This objection alone is, I think, almost fatal to the use of the radiometer as a photometer. From these experiments it would also appear that at certain pressures the radiometer is extremely sensitive to increase of pressure. Thus, taking the difference of temperature as being from 68° Fahr. to (say) 95° Fahr., there would be an increase in pressure in the radiometer of from 100 up to about 105 pressure, and this has caused a diminution in the distance at which the standard light is placed from about 55 to 40, or a decrease of distance equal to more than 25 per cent. Mr. Crookes's experiments have shown that at certain points a slight increase of pressure does rapidly decrease the sensibility of a radiometer to radiation, but the decrease of sensibility shown in the above experiments appears to be more rapid than Mr. Crookes's researches would indicate.

CHIPPING ONGAR GAS, COAL, AND COKE COMPANY, LIMITED.—This Company registered on the 7th inst., with a capital of £5000 in £10 shares, proposes to acquire the gas-works at Chipping Ongar, Essex.

* Proc. Roy. Soc., xxv., p. 305.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE TOTTENHAM COURT ROAD EXPLOSION.

SIR,—I notice in the last number of the JOURNAL a letter from Mr. A. Salanzen, stating that no thoroughly satisfactory explanation has yet been offered of the intervals of time alleged to have elapsed between the successive explosions in the Tottenham Court Road. Mr. Salanzen offers an explanation which is certainly feasible, but involves the supposition that the whole of the seven explosions were absolutely simultaneous. I do not think it is probable that this was so, and consider it far more likely that they were successive. I herewith beg to contribute a few words towards the better comprehension of the question.

In the first place, I firmly believe that the contents of the main at the time of the explosion were fairly homogeneous in composition. If any difference in composition existed, it was probably that at the point where the gas entered the main, the mixture contained the largest percentage of gas, and at the portion of the main most removed from that point, the mixture contained the largest percentage of air. Slight differences of composition in the way indicated may have existed, but I think it can be fairly assumed that at the time of the explosion the mixture of gas and air in the main was practically uniform throughout. Now every gaseous mixture which contains within itself the elements necessary for explosion or inflammation takes a definite time for ignition; that is to say, where the inflammable mixture is arranged as it were in a train (as along some 2000 feet of piping), a definite interval would be required for the ignition of the mixture from the one end to the other. The absolute velocity at which the ignition would proceed down the main would depend on the composition of the gaseous mixture. It would be most rapid where the proportions of the gas and air were most favourable for explosion, and slowest when either ingredient in the mixture was largely in excess of the other.

Now what may be supposed to have happened at the accident is this. Starting with the application of the unfortunate light, the first effect of the ignition of the mixture of gas and air was a violent discharge from the near end of the pipe. As the explosion travelled on, the pressure in the main accumulating to such an extent that it could not be relieved speedily enough by discharge at the open end, the weakest spot in the main next the point of ignition gave way, and an absolute explosion took place. As the ignition of the gaseous mixture proceeded along the main, the pressure again accumulated, and the next weakest point in succession gave way, and so on for the seven explosions.

This explanation appears to me to be reasonable, and in accordance with the facts of the accident, and also in accordance with our knowledge of the laws attending the ignition of inflammable gaseous mixtures.

Stepney, E., Aug. 27, 1880.

H. LEICESTER GREVILLE.

CORRECTION.

SIR,—In the discussion on my paper upon Hislop's Lime Process, published in the last issue of the JOURNAL, I appear having said that hydrogen and nitrogen combine to form water. What I meant to say was that the hydrogen probably combines with the nitrogen of the air, and goes off in the steam.

Aug. 26, 1880.

A. F. WILSON.

Legal Intelligence.

LAMBETH POLICE COURT.—FRIDAY, JULY 23.

(Before Mr. ELLISON.)

ALLEGED CONSPIRACY TO DEFAUD A GAS COMPANY.

Thomas Henry Carman, landlord of the Grapes public-house, Windmill Street, Haymarket; William Thomas Carman, son of the above, a billiard-keeper, of Station Road, New Kent Road; John Phillips, manager at the same place; and Joseph Horton, gasfitter, of 13, Hanover Court, Long Acre, were summoned at the instance of the South Metropolitan Gas Company for unlawfully conspiring to defraud the Company of a quantity of gas.

Mr. WASHINGTON prosecuted on behalf of the Company; Mr. WALTER SLAHER appeared for the two first-named defendants, and Mr. W. H. FULLAGAR defended Phillips. Horton did not answer to the summons against him, and a warrant was issued for his apprehension.

Mr. WASHINGTON having briefly stated the facts of the case, called the following witnesses:—

JOHN SLAHER said: I am a labourer, living in Hanover Court, Long Acre. The defendant Horton lodged at the same place. He is, I believe, a gasfitter, by trade. Early in May last we went once or twice into the Grapes public-house, in Windmill Street, kept by Mr. Carman, sen. On one occasion Horton said to Mr. Carman: "I can save you a great deal of gas if you have a wet meter." Mr. Carman said: "No; it is a dry meter." Horton afterwards remarked to Mr. Carman that by piercing the drum of the meter the gas would escape to the body of the meter, and so pass into the service-pipes without being recorded by the index. This was said at the bar of the house, and only Horton, Mr. Carman, and I were present. Mr. Carman said: "Yes, I have not got a wet meter, but I can recommend you to a place over the water where they consume a good deal of gas. It is in the New Kent Road. I will give you the direction." Horton and Mr. Carman went together into the private part of the house, and were away some five or six minutes. I stayed at the bar. When they came back Horton told me that he had asked Mr. Carman £5 for the job.

Mr. SLAHER objected to this evidence being given. Horton was not, he said, present, and such evidence as this ought not to be received as against Mr. Carman.

Mr. ELLISON: I cannot agree with you. It is clearly the opening of an unlawful act.

Mr. FULLAGAR said he thought not.

Mr. ELLISON: You see the words used were "by piercing the drum," &c. Mr. SLAHER: Yes; but that was only according to the witness's statement. Horton and the witness were not only tempters but co-conspirators. If such evidence as this is allowed, Mr. Carman will not have the slightest chance of contradicting it.

Mr. ELLISON said it would, of course, require corroboration.

Examination continued: Horton told me he had asked Mr. Carman for a 55 note for the job, but he would only agree to give £3, which would be paid by instalments—10s. down, and the remainder at so much per month. A day or so afterwards we went to the New Kent Club, near the Elephant and Castle Railway Station. Horton and I went together, but we did not take any look with us. "I went into the club and there saw Mr. Carman, jun., and the defendant Phillips, the secretary of the club. This was from ten to half-past ten o'clock in the morning. I saw Horton speak to Mr. Carman, jun., but I did not hear what he said. I went with Horton as a sort of labourer, to assist in case I was wanted. After the conversation between Horton and Mr. Carman, jun., Horton gave me half-a-crown, and told me to go and get a drill made, and I did so.

Mr. SLEIGH: I must submit that this is not evidence.

Mr. ELLISON: I see a clear understanding between Horton and Carman, which I infer to be a conspiracy. There is something to show that Horton and his witnesses went to the club in the New Kent Road, which had been mentioned by Carman, sen.

Mr. SLEIGH: Yes; I concede that, and that they went over there authorized by Carman, sen.; but there we reach a point we have no power to contradict. What I am going to show is that other people have gone over before us both before and after this. I have no wish to keep anything back. These two men were in conjunction and conspirators, and before such evidence is admissible I submit that it requires corroboration.

Mr. ELLISON: Yes; but that corroboration may come afterwards.

Mr. SLEIGH: I will admit that. If your worship is against me on this point, I bow to your opinion.

Mr. FULLAGAR: There is not a little of evidence up to this time against Phillips.

Mr. WASHINGTON: If in the end that is so, I shall certainly withdraw the charge as against him.

Examination continued: I went to a shop in Nevington Causeway. The drill now produced, as far as I can say, is the one that was made. Horton left half-a-crown deposit on it, and we went back to the billiard-room of the club. Horton then directed me to borrow a pair of steps to get up to the meter, which was on a platform at the end of the room. I borrowed a pair of steps, and went up. This was the first time I was down, and were there during the whole time I fixed the steps. Horton went up to the meter, and I followed him. Neither Phillips nor Carman, jun., went up the ladder. Horton took off the tap.

Mr. SLEIGH: I must again interpose, your worship. (To witness:) Could Phillips or Carman, jun., see what was going on?

Witness: No. Horton unscrewed the overflow tap and introduced the drill into the hole. He gave it two or three bumps, and then found the drill too thick to act. Horton said, "I have never seen a meter like this before; it has got a guard in front of it." Horton found he could not get it, and said, "Let me see this." This was the first time I was down, and Horton went to Carman and spoke to him. I was not close to them, but I heard him say "We've done it."

Mr. SLEIGH: You said just now you were not close to them, and therefore how can you know what was said?

Witness: I heard something, but I was not close to them.

Mr. ELLISON: Repeat the words as near as you can.

Witness: Well, it was words to this effect—"We've done it." Carman, jun., then walked to a small bar, and I did not hear anything more said. We left in company with Carman, jun., and went to the shop where we had obtained the meter. Horton returned the drill, and I afterwards gave him with a piece of paper, which I am under the impression Phillips gave him.

Mr. SLEIGH: Stop, if you please. Let us have none of your "under the impressions."

Mr. ELLISON: Did you see the paper given by Phillips?

Witness: Horton, Phillips, and Carman, jun., were together when it was given, but I cannot say positively who gave it. Horton afterwards gave the paper to Carman, sen., saying, "We have been over there." Carman, sen., gave Horton 5s., and Horton said, "That's not according to our agreement; you promised to give 10s." Horton said, "Carman, sen., said, 'You don't suppose I am going to give you 10s. when I don't know if it's done or not.' We then left the house."

FRIDAY, JULY 30.

The witness Allen was recalled, and further examined, said that a few days afterwards he went again with Horton to the club and saw Carman, jun. and Phillips there. Horton said to Phillips, "How is it getting on, Governor?" or something like that. Phillips replied that there was no difference in the consumption. Horton looked at the index of the meter, and took it on a bit of paper, which was showed to Phillips. There was a conversation, but he (witness) could not remember what it was. They afterwards went to a place in Westminster, and Horton asked a man there to make a drill. He told him the size, and the man said he could come the next day for it. On the following day the man, whose name was Underhill, gave Horton a drill. A few days after another drill was given to Horton. Nothing was said to Underhill as to what the drills were wanted for. Horton afterwards at home found the awl (produced) with a handle. He said this sort of awl would do, and would be just about the thing. They then went to the elder Carman's, and Horton showed him the two drills. The witness was present in the bar at the time. Horton and Horton again went to the club, and Horton showed the awl, and a hammer. They saw Carman, jun. and Phillips there. Horton said to Carman, "We have come over to do the meter again," or words to that effect; but witness did not remember if any reply was made. Horton and Horton then went to the meter, and Horton placed the awl in the overflow plug, and gave it a tap with the hammer. Witness believed it pierced the drum and guard of the meter, but could not see. Gas came out with a whistling sound, and as if with pressure. Horton then said, "That's done it." Horton subsequently said to Carman, jun., "I've done it." Horton then went to the witness, and said, "I want to have some money, but Mr. Carman told him he must wait for a day or two, and see how the meter went on. Witness was not sure whether or not any money was given to Horton by Carman; but thought not. A day or two afterwards witness again went over to the club with Horton, and Phillips produced a list of the readings of the meter. Horton showed the paper, which he (witness) should know again if he saw it. Phillips said they had only burned 600 feet of gas for the past two nights, and Horton said, "That's better." Phillips said that it was much less than the other evenings. Phillips gave Horton a note to take to Carman, sen., and they went again to Carman's house the next day. Horton asked Mr. Carman, "For some money, and he gave him some out of the till, but witness did not know how much. They went several times about money, and then a dispute arose, Horton saying Mr. Carman had not acted up to his contract. Mr. Carman said he did not believe a bit of good had been done, and Horton said that he had intended to "do" him, he (Horton) would "do" for him. Mr. Carman seemed offended, and walked away. Witness from first to last had not received any money. Horton kept the money and spent it. All the witness had was some beer. On one occasion Phillips said there had been an extensive leakage; but this was after the puncture

of the meter-drum had been made; before that witness had heard nothing about leakage.

In cross-examination, witness said he had been in service of the prosecutors since he turned round on Horton. He had had 18 months imprisonment for passing counterfeit coin, but was hard at work before that. Witness obtained the awl, witness knew he meant to defraud the Company. He knew that Phillips told Horton that a gas plumber had been to see the meter, and that he had mentioned to the plumber what had been done, and he said he had done a very foolish thing. Would swear that he did not say Briggs had found out that the meter had been tampered with.

FRIDAY, AUG. 6.

John Robbins, a blacksmith, working in York Street, London Road, said he knew Allen and Horton, and the first time he saw them they came and asked the foreman to make them a drill. Horton spoke, but he did not say what it was for. He saw a file on the bench, and said that would do if it was drawn down to the sixteenth of an inch. The file produced was not, in his opinion, the one which was given to Horton. Horton brought the file back and said it was no use for what he wanted it for, and the deposit of 2s. 6d. was returned to him.

Some evidence was then given by John Smeaton, of 16, Station Road, as to lending the pair of steps to Allen to enable him to get up to the meter, and by Samuel John Underhill, of 101, Vauxhall Bridge Road, an engineer, who said he knew Horton very well. He borrowed two small punches of witness, as he said he had a little gas-fitting job to do. The two punches were not used. Horton told the same story as to the premises in Station Road, also gave evidence as to Carman, sen., being his tenant.

Mr. Charles Howard, Chief Inspector of the Company, said Allen, after seeing the Secretary, made a communication to him, and witness gave instructions for the meter to be fetched away and another put in its place. He examined the meter afterwards at the testing office, Southwark Street, and was informed it registered correctly. After further examination the waste box was taken off, and then two perforations were found in the guard, such as would be made by either of the three instruments produced. The inner case had not been used. If it had been it would have passed gas, to the extent of the hole, without registering. With such holes gas could have been taken through the waste plug by a tube, but he could not tell if gas had been abstracted or not. Permission was never given to any one to tamper with the Company's meters, and there would be no question of punches like those produced, or other instruments, being used, and there was no defect that could be remedied by such an operation. If there was any flickering in the lights there would be no necessity to do anything through the waste-plug.

George Frank, Inspector, gas-meter maker, gave evidence, saying he was a member of the Company, and took the state of the index of the meter in question when it was removed.

Some evidence was then given as to the connection of the meter with the pipes; after which

Mr. George Detheridge, Inspector of Meters for the district, gave evidence as to the meter in question being found. He tested the meter and found it registered correctly. There was nothing that could be remedied by punching a hole through the waste plug. If such a hole was punched, the plug could be used to abstract gas unregistered.

Edmund Reid, a detective of the P Division, who had charge of the case, produced the instruments produced from the witness Allen, and a file from another witness.

FRIDAY, AUG. 20.

Mr. George Hewes, a clerk in the employ of the Company, said he kept the register of complaints. He produced the same, being in his handwriting. There was no complaint whatever in respect to the new meter or gas-fittings at the New Kent Club, Station Road, from the commencement of May down to the 15th of July. On the 15th of July he received the following letter, signed by T. Carman: "In consequence of water being leaked in from the meter, I am directed to have a dry meter fixed Saturday. Please send an index of the wet meter now in use."

Mr. WASHINGTON (to Magistrate): You will remember, Sir, this was after the second meter had been fixed and the first meter taken away. The substance of the complaint on the 19th of July, was that the first meter had been taken away by the Company in compliance with this. This is the case for the prosecution, and upon the evidence given I ask you to commit the defendants for trial on a charge of conspiracy to defraud the Company.

On his behalf he was only appearing on the part of Phillips, and on his behalf he asked whether his worship thought there was a title of evidence against him upon which he could possibly be committed to take his trial.

Mr. ELLISON said the case of Phillips was that he was simply present, but really knew nothing about it, and was only a servant.

Mr. WASHINGTON said the Magistrate had forgotten, in the voluminous evidence which had been taken, that he showed the register to Allen.

Mr. FULLAGAR: That register I hold in my hand as one of the most conclusive proofs that Phillips has been in a way mixed up in this attempted fraud, if it is an attempted fraud. Here is the index of the meter, which I produced, and which was brought on the part of the prosecution, to say whether they can contradict the items of the state of the meter as put down daily by Phillips; and if not, it would clearly show that after this tampering by these two men had taken place before the index actually proved more against the consumer than it did before.

Mr. WASHINGTON: My friend very wisely has not put in that register; nor have I a copy of it.

Mr. FULLAGAR: You have had an opportunity of seeing it; and I put it in one of the registers, and I was able to prove that these daily takings by Phillips are correct? I should like to ask Mr. Howard if he can give me some information about it. I do not know if he can.

Mr. Howard, recalled, said, in reply to Mr. Fullagar, that the agreement with the Company was signed on the 15th of May last, and the meter would be put up, he supposed, on the following day. The meter would be examined at the half quarter and quarter, making once in every six weeks.

The amount of gas consumed had been given in evidence by the person who took it down.

Mr. FULLAGAR: I want to know, Mr. Howard, is there any witness, a person, or body, looking at this statement, or representing the daily consumption of gas through this meter, can say whether in his opinion it is correct or not?

Witness: It would be almost impossible for any man to say so, unless it is the person who took it down daily. In a billiard room the consump-

tion depends upon the quantity of play going on. It is an unpractical question, which no one could answer unless he had been present and witnessed the play.

Mr. ELLISON: The gas may be burning at a table for an hour or two hours, or the whole evening through.

James Allen, recalled and further cross-examined by Mr. FULLAGAR, said that Phillips in no way interfered with Horton and himself. Phillips was having breakfast at the time. Phillips did not complain to him of the flickering and bad light which the gas gave, but he might have done so to Horton. Some papers were handed to the witness, which he said he could not swear to as being the paper Phillips showed him. One of them was very similar (the daily register of the meter), but a great deal more had been added to it. It was possibly the latter end of May when he was shown the paper.

Mr. FULLAGAR: The latter end of May would only extend down part of the page. It has been continued during June and July. That would account for the difference. (To witness.) Taking this paper down to three (pointing), does it represent what was shown to you?

Witness: Yes, or a little lower down.

Mr. FULLAGAR: Then I shall put the paper in.

The defendants were then cautioned and asked if they had anything to say in answer to the charge.

Carmen, sen., said he was perfectly innocent, and had no idea of attempting to defraud the Company.

Phillips had nothing to say except that he was only a servant, and that he had been continually complaining of the gas being bad.

Horton said: These three men know nothing about this affair whatever. I merely went to look at the meter. There was a chipping of the light. There was a bit of metal on the water socket which prevented the water coming out of the socket, and I tried to remove it. The next I heard of the affair was there was a summons out against me for damaging the meter. I plead guilty to damaging the meter through ignorance on that point. I think it is very unjust and unfair, these three men should be brought into this affair, if they know nothing.

Carmen, jun., declined to say anything.

In answer to Mr. Ellison, the defendants said they would not call any witnesses, and were then committed for trial to the next Surrey Sessions to be held on the 10th of September, their own recognizances being taken for the appearance of the Carmens and Phillips at two sureties of £15, or one of £30, with notice to the police, were required as regards Horton.

Miscellaneous News.

SCARBOROUGH GAS COMPANY.

The Annual Meeting of this Company was held on Saturday, the 21st inst. Mr. W. Robinson, in the chair, when the Directors presented their report, which stated that notwithstanding that the price of gas was reduced from the commencement of the present year, and the great economy practised by all classes of consumers, the Company's receipts showed an increase over the preceding year, whilst the cost of manufacture had been materially reduced. The sum expended in the erection of mains, service-pipes, lamps, and some minor extensions at works (£533 16s. 5d.), and the further sum expended in replacing the foul main and an exhaustor, and in providing two meters of large capacity for the Spa (£706 16s.), had been placed to the suspense account, which, with the balance to the debit of the account, made a total of £2470 7s. 8d. This sum had been transferred from the revenue account, and thereby liquidated the suspense account altogether. The balance of revenue account after this transfer, and after deducting the half-year's dividend paid in March last, and meeting every liability of the Company, amounted to £2470 7s. 8d., which enabled the Directors to recommend the payment of a full dividend to each class of Proprietors, leaving a balance of £96 4s. 7½d. to carry forward to the contingent-fund, which will then amount to £3994 5s. 11½d. The Directors also recommended that £15,000 of new ordinary stock should be created to meet the cost of the Company's new gasholder, and any future outlay that may be required. The total outlay on capital account to June 30 was £150,081, which included the expenditure of £3861 during the past twelve months. The receipts from gas and meter rentals, public lamps, &c., during last year were £24,992; and from residuals, £5212.

On the motion of the CHAIRMAN, seconded by Mr. BECKETT, the report was adopted.

The CHAIRMAN then moved that a dividend of 10 per cent. on the original stock, 7½ per cent. on the new consolidated stock, and 7 per cent. on the new ordinary stock of the Company, for the half year ending June 30, be paid.

Alderman FOWLER seconded the motion, which was carried.

The three retiring Directors (Messrs. P. Hick, F. Ness, and T. Hick) and the retiring Auditor (Mr. Hawson Herbert) were re-elected; Alderman Fowler was elected a Director in the place of Mr. A. Clapham; and £900 was placed at the disposal of the Directors as a remuneration for their services during the current year.

An extraordinary meeting of Shareholders was then held, when resolutions were carried with reference to raising additional capital, recommended in the report.

A cordial vote of thanks to the Chairman and Directors concluded the proceedings.

METROPOLIS WATER SUPPLY.

The following is Mr. Frankland's report of his analyses of the water supplied to London during July:—"Taking the average amount of ordinary supply contained in a gallon of water, the quantity of water supplied during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Colne Valley, 1½; Kent, 1½; Tottenham, 1½; New River, 2½; Chelsea, 3½; West Middlesex, 3½; East London, 3½; Lambeth, 4½; Grand Junction, 4½; Southwark, 5½. The Thames water delivered by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was inferior in quality to that delivered in June, and it was slightly turbid when drawn from the mains of the West Middlesex and Lambeth Companies. The water of the Lambeth Company contained moving organisms. The water drawn from the Lea by the East London Company was no better than Thames water, but that abstracted by the New River Company, partly from the same source and partly from springs, would have been nearly equal to deep-well water, if it had been efficiently filtered. It was, however, slightly turbid, and contained a few minute organisms. The deep-well water supplied by the Kent and Colne Valley Companies and by the Tottenham Local Board of Health was of its usual excellent quality for domestic purposes, and that delivered by the Colne Valley Company was suitable for all domestic purposes, having been softened before delivery. So long as a stratum two feet deep, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; New River, slightly turbid, and nearly colourless; Chelsea and East

London, clear and very pale yellow; West Middlesex and Lambeth, slightly turbid and very pale yellow; Southwark and Grand Junction clear and pale yellow.

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Mat- ters.	Or- gan- ic Car- bon.	Or- gan- ic Nitro- gen.	Ammonia.	Nitrogen, as Ni- trates and Nitrites.	Total combined Nitro- gen.	Chlo- rine.	Total Har- dness.
<i>Inner Circle.</i>								
Thames	21.00	.143	.040	0	.114	.184	1.6	19.7
Chelsea	22.96	.177	.028	.002	.144	.174	1.5	18.2
West Middlesex	25.38	.263	.044	.001	.113	.168	1.5	20.2
Southwark	25.32	.240	.020	0	.113	.168	1.6	20.0
Grand Junction	25.32	.240	.020	0	.113	.168	1.6	20.0
Lambeth	22.90	.204	.037	0	.066	.103	1.6	17.1
<i>Lea.</i>								
New River	26.46	.098	.023	0	.184	.207	1.6	20.9
East London	27.02	.091	.029	.003	.102	.134	1.8	20.9
Deep wells—Kent	42.90	.073	.017	0	.404	.421	2.3	27.8
<i>Outer Circle.</i>								
Tottenham	12.72	.051	.014	.005	.363	.381	1.4	6.9
Tottenham Local Board	39.84	.086	.013	.058	0	.060	2.9	20.5
Corporation of Birming- ham*	28.36	.175	.020	.004	.253	.276	1.7	16.7
Corporation of Glasgow*	2.88	.136	.016	0	.006	.022	.6	.9

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Agent to the Borough.
* Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

The Registrar-General publishes the following table in reference to the water supply of London during July. According to the returns furnished to him by the Metropolitan Water Companies, 150,308,010 gallons, or 683,327 cubic metres of water (equal to about as many tons by measure, fons by weight), were supplied daily, or 256 gallons (116.9 decalitres), rather more than a ton by weight, to each house, and 39.9 gallons (16.3 decalitres) to each person, against 33.7 gallons during July, 1879.

COMPANIES.	Number of Houses, &c., supplied in July, 1879, July, 1880.		Aver. Daily Supply of Water in Gallons* during July, 1879, July, 1880.	
Total supply	566,943	588,560	135,618,047	150,398,010
From Thames	270,176	238,006	70,175,631	75,796,855
" Lea and other Sources	296,767	350,554	65,442,416	74,601,155
THAMES.				
Chelsea	39,700	36,071	9,130,200	9,652,960
West Middlesex	52,383	55,154	11,040,207	11,948,062
Southwark and Vauxhall	66,579	69,765	23,368,175	24,323,520
Grand Junction	39,648	42,314	12,266,118	13,559,904
Lambeth	61,726	64,702	13,771,900	16,312,560
LEA AND OTHER SOURCES.				
New River	128,462	131,103	27,951,000	30,668,000
East London	120,159	125,478	29,108,900	33,096,000
Kent	47,816	49,973	8,882,516	8,932,425

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for July, 1880, as compared with that for the corresponding month of 1879, shows an increase of 22,617 houses, and of 14,779,963 gallons of water supplied daily.

A PROPOSAL TO SUPPLY WATER FOR LONDON FROM BALA LAKE.

The following is a proposal to supply London with water from Bala Lake, North Wales, which, it is stated, was submitted to Sir William Harcourt by Mr. J. W. Welbore for consideration by the Select Committee of the House of Commons, whose report we have already published (see ante, p. 219):—

The water of Bala Lake has been carefully tested and proved to be equal in purity to the water of Loch Katrine, and ample in quantity for the supply of the Metropolis. It is also probably sufficient for the towns en route. The country adjacent is sparsely populated, and a few mountain sheep and grouse constitute the occupants of the surrounding hills; hence there is a minimum of possible pollution. The rainfall registered at Bala for the year 1876 was 52.8 inches, which is about the average rainfall in the district. The lake is nearly 10 miles long by 3-mile wide, covering 1100 acres. The watershed of the district contains 35,392 acres, or 55 square miles. This with the Bala register of rainfall would, after deducting 10 per cent. for absorption, give 37,040 million gallons per year, or 104 millions per day. But inasmuch as Bala lies on a level with the sea, the register of rainfall there does not represent the rainfall of the district. On the surrounding mountains the rainfall is probably twice as much as in the valley, which will leave a large surplus for supply, after giving compensation to the river.

The lake is 558 feet above Trinity high-water mark, and 900 feet above Falmouth, and it is proposed to make the reservoirs. By embanking the lake 5 feet, and drawing down 2 feet below the present level, sufficient water can be impounded to supply 104 million gallons daily, for 37 days without any rainfall. Should a further supply be required, 50 million gallons per day can be obtained from the River Yrnyw, which is situated on the lines of route to the Metropolis.

It is proposed to convey the water from Bala through a series of iron pipes, sunk to a depth sufficient to protect them from the action of the frost, along the sidings of the Great Western Railway to Steamers, where the reservoirs should be on a scale adapted to provide for a storage of water equal to 40 days supply. These should consist of one or more large reservoirs and ten smaller ones. The large reservoir would be capable of holding 300 million gallons or 30 days supply, and would be lined with brick or stone. The ten smaller ones, lined with white glazed brick, would each be calculated to contain 100 million gallons. The space required for the reservoirs would be 500 to 600 acres for the large ones, according to depth, and 25 acres for each of the smaller ones. The water would be delivered into the large reservoirs as pure as at its source, thence it would pass through a system of filtration of approved character into the smaller reservoirs in a condition of absolute purity. These reservoirs being 250 feet above the Bank of England, the water on reaching London would be conveyed through the existing mains of the Water Companies at high-service level.

Had Bala Lake existed at Stanmore instead of in North Wales, it would doubtless long ago have formed the source of the London Water Supply. If it is approved as a source of supply, it is simply an engineering question how to convey the water for the use of the Metropolis free from pollution in the most effectual and economical way.

By adopting the sidings of the Great Western Railway as the route, the following advantages would be obtained:—1. The right of way for almost the entire route would be secured by one negotiation. 2. Land otherwise of no value would be utilized without detriment either to it or to the property of the Railway Company. 3. All the plant required would be de-

SOUTH METROPOLITAN GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday at the Bridge House Hotel, London Bridge—Captain THOMAS B. HEATHORN, R.A., in the chair.

The SECRETARY and ENGINEER (Mr. George Livesey) read the notice convening the meeting and the minutes of the last general meeting.

The CHAIRMAN then affixed the seal of the Company to the register of Shareholders, stating that it had been examined very carefully.

The following report of the Directors and accounts of the past half year's working were taken as read:—

At the meeting in April last, the announcement was made that the amalgamation of the Phoenix Company had been confirmed. The United Company now consists of three out of the four Metropolitan Companies which supplied gas south of the Thames.

This being the first half year of the Amalgamated Company, it is not possible to make a comparison with the working of the corresponding half of last year. The Directors are, therefore, unable to give a detailed statement of the results of the amalgamations;

livered by the Railway Company at the places where it would be laid. 4. The telegraph system would be available in case of any accident to the pipes. 5. There would be great saving in the time required for the construction, and also great saving in the cost.

By making the reservoirs at Stanmore, a sufficient level would be obtained to supply the high service to London without pumping, the cost of which, at present, with filtration, is about £100,000 per annum. By the use of white glazed bricks for the lining of the smaller reservoirs, facilities for quickly and thoroughly cleansing them would be obtained. In short, pure water would be delivered from them as from a china basin.

COAL GAS COMPANY.

suffice it to say, they are so confident those results will be favourable, that they have reduced the price of gas in the district of the late Phoenix Company, from 3s. 4d. to 3s. per 1000 feet from Midsummer last, thus making the price uniform throughout the whole district of the Company.

By the scheme of amalgamation, they were empowered to maintain a differential price until the end of the year, but it was considered that the interests of both consumers and proprietors would be served by a reduction at the earliest possible moment.

The new gasholder is progressing satisfactorily, and the various stations of the Company are in a good state of efficiency. Provision is being made at the works of the late Phoenix Company to comply with the requirements of the recent legislation as to purity, &c.

The accounts now presented show a profit sufficient to warrant the recommendation of the following full dividends, viz.:—11½ per cent. on the "A" stock; 11 per cent. on the "B" stock (late Surrey capital), and 10½ per cent. on the "B" stock (late Phoenix capital). The dividends will be paid on the 8th of September next.

As a consequence of the price of gas being made uniform, the two divisions of class "B" are now completely merged, and rank equally for dividend and in all other respects after payment of the present dividend.

No. 1.—STATEMENT OF CAPITAL (STOCK) on June 30, 1880.

Acts of Parliament authorizing the Raising of Capital.	Standard Dividend; the Standard Price being 3s. 6d.	Paid up.	Amount not paid up.	Total Amount Authorized.
South Metropolitan Acts, 1842 and 1869. A	10 per cent.	£500,000 0 0		£500,000 0 0
Supply Consumers Acts, 1854 and 1868. B	Do.	249,570 0 0	£50 0 0	250,000 0 0
Phoenix Acts, 1824 and 1864. B	Do.	1,001,982 0 0	18 0 0	1,002,000 0 0
South Metropolitan Act, 1876. B	Do.	..	18,000 0 0	18,000 0 0
Do. Do. 1876. C	Do.	..	232,000 0 0	232,000 0 0
		£1,831,952 0 0	£250,048 0 0	£2,082,000 0 0

No. 2.—STATEMENT OF LOAN CAPITAL *on June 30, 1880.*

Acts of Parliament authorizing Loan Capital.	Description of Loan.	Rate per Cent. of Interest.	Total Amount Borrowed.	Remaining to be Borrowed.	Total Amount Authorized.
South Metropolitan Act, 1869	Debenture Stock.	Not exceeding 5 per cent.	£58,868 10 0	£3,631 10 0	£62,500 0 0
Do. 1876	do. 5 do.	5 do.	187,500 0 0	187,500 0 0	187,500 0 0
Survey Consumers Acts, 1864 & 1863 .	Bonds.	Do. 5 do.	59,500 0 0	500 0 0	60,000 0 0
			£118,368 10 0	£191,631 10 0	£310,000 0 0

No. 3.—CAPITAL ACC

To Expenditure to Dec. 31, 1879 . . .	£1,970,378	4	10	Description of Capital.	Certified to Dec. 31, 1879.	Received since that Date.	Total to June 30, 1880.
Expenditure during half year to June 30, 1880, viz.:—							
New buildings and machinery in connection of works . . .	£30,234	19	2	By A stock	£500,000	0	£500,000
New and additional mains and services . . .	5,149	8	11	B stock	249,870	0	249,870
New and additional meters . . .	2,124	16	8	Bonded stock	16,718	0	38,508
				Bonds	60,000	0	38,500
	37,509	4	9	*Shares of £20 each	340,000	0	540,000
Total expenditure	£2,007,887	9	7	*Capitalized stock	114,000	0	144,000
Less by conversion under scheme	161,994	0	0	*New stock	324,000	0	324,000
				*New Shares of £20 each	200,000	0	200,000
	£1,845,893	9	7				
Balance	104,427	0	5				
				Less paid off		£78,126	10
						500	0
					£2,034,688	0	£2,112,314
				Less by conversion under scheme	£77,626	10	161,994
	£1,950,330	10	6				£1,950,320

⁸ These Shares and Stocks are now converted into equivalent amounts of Ordinary "B" Stock.

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—		By Sale of gas—	
Coals, including dues, carriage, unloading, and trimming. (See Account No. 9)	£126,144 10 0	Common gas (per meter)—	
Purification, including £141 9s. 2d. for labour.	4,730 15 3	at 3s. 4d. per 1000 cubic feet	£132,563 7 3
Salaries of Engineer, Superintendent, and Officers at works	5,717 8 0	at 3s. per 1000 cubic feet	130,075 0 3
Wages (carbonizing)	27,578 7 2		£233,578 7 8
Repairs and maintenance of works and plant, materials, and labour, less £237 10s. 11d. received for old materials.	27,469 10 10	Public Lighting and under contracts (see Statement No. 11)	25,989 11 11
	£191,740 11 3	Rental of meters	£279,567 19 7
Distribution of gas—		Residual products—	5,695 8 7
Repair, maintenance, and renewal of mains and service-pipes, including labour	£7,578 4 9	Coke, less £237 9s. 2d. for labour and cartage.	£43,656 9 1
Salaries and wages of Officers (including Rental Clerks)	8,311 16 5	Dross, less £783 8s. 6d. for labour and cartage.	664 8 8
Repairing and renewals of meters	4,341 7 5	Tar	17,818 13 5
	20,531 8 7	Ammoniacal Liquor	19,166 14 7
Public lamps—Lighting and repairing	9,525 11 7	Rents receivable	80,706 1 0
Rents, rates, and taxes—		Transfers fees	1,454 7 3
Rents payable	£882 1 5		13 17 6
Rates and taxes	7,202 19 10		
	8,085 1 3		
Management—			
Directors allowance	£2,330 10 7		
Do. compensations	17,314 7 1		
Salaries of Secretary and Clerks	4,432 14 6		
Collectors commission	5,533 11 0		
Stationery and printing	1,407 3 3		
General Charges	963 13 0		
Company's Auditors	112 10 0		
Auditors compensation	605 0 0		
	32,648 12 5		
Law and parliamentary charges	2,036 10 1		
Bad debts	1,187 7 11		
Superannuation-fund	992 6 8		
Gas Referees and Official Auditor	178 11 11		
Total expenditure	£262,926 1 8		
Balance carried to net revenue account, No. 5	101,511 14 0		
	£367,437 15 8	Total receipts	£367,437 15 8

Total receipts	£367,437 15 8
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No. 5.—PROFIT AND LOSS (NET REVENUE) ACCOUNT.

Interest on temporary loan and deposits	£415 11 3	Balance from last account	£142,138 15 4
Amount for debenture interest	1,204 10 1	Less dividend on ordinary capital for the half year ending Dec. 31, 1879	93,115 0 4
Amount for bonds	1,435 9 9		
Reserve-fund	734 0 7		£8,743 15 0
Compensation under amalgamation scheme	45,821 9 5	Amount from revenue account, No. 4	104,511 4 0
Balance applicable to dividend on ordinary share capital	104,005 7 9	Interest on moneys on deposit	368 19 10
	£153,024 8 10		£153,024 8 10

No. 9.—STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1879.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, Dec. 31, 1880.
	Tons.	Tons.	Tons.	Tons.	Tons.
Newcastle coal	31,382	175,666	182,173	163	24,085
Canal coal	2,339	6,780	7,011	..	2,078
	33,721	181,816	189,214	163	26,160

* Under Weights and Measures Act, 1878.

No. 6.—RESERVE-FUND.

Balance on June 30, 1880	£180,740 12 5	Balance on Dec. 31, 1879	£176,762 19 7
		Interest on amount invested	724 0 7
		Do. do.	3,258 12 3
	£180,740 12 5		£180,740 12 5

No. 7.—RENEWAL-FUND (LEASEHOLD.)

Balance on June 30, 1880	£3,569 5 6	Balance on Dec. 31, 1879	£10,900 0 4
Renewal of lease (Surrey Commercial Dock Co.)	7,500 0 0	Interest on amount invested	169 5 2
	£11,069 5 6		£11,069 5 6

No. 8.—INSURANCE-FUND.

Balance on June 30, 1880	£20,865 1 7	Balance on Dec. 31, 1879	£20,730 17 1
		Interest on amount invested	123 4 6
	£20,865 1 7		£20,865 1 7

No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

	In Store, Dec. 31, 1879.	Made during Half Year (estimated).	Used in the Half Year (estimated).	Sold in the Half Year.	In Store, June 30, 1880.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coke . . . "Chaldrons of 36 bushels.	11,804	249,136	61,276	189,023	7,631
Do. do. 36 do.	1,894	16,096	1,550	15,708	1,442
Tar . . Gallons	134,215	1,913,781	3,900	1,938,784	105,412
Ammoniacal liquor—batts of 109 gallons, 8-oz. strength	6,698	49,901	..	53,393	3,294

No. 11.—STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity made, partly measured in Gasholders.	Public Lights (estimated).	Private Lights (per Meter).	Total Quantity sold.	Quantity used on Works, &c. (partly estimated).	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	1,857,562	137,183	1,610,846	1,747,029	17,000	1,765,029	92,333	15,065

No. 12.—BALANCE-SHEET.

To Capital—		By Cash at Bankers	£20,930 19 3
For balance, per account No. 3	£104,427 0 3	Amount invested—	
Reserve-fund—		Reserve-fund	£180,740 12 5
For balance, per account No. 6	180,740 12 5	Renewal-fund	3,569 5 6
Renewal-fund—		Insurance-fund	20,865 1 7
For balance, per account No. 7	3,569 5 6		205,174 19 6
Insurance-fund—		Cash in hand for freight, accounts, &c.	3,245 2 6
For balance, per account No. 8	20,865 1 7	Stores in hand—	
Net revenue account—		Coal	£19,455 1 8
For balance, per account No. 5	104,005 7 9	Coke and breeze	2,452 12 0
Debiture and bond interest for amount due to June 30, 1880	2,637 19 10	Tar and ammoniacal liquor	2,298 14 0
Sundry tradestmen, for amount due for coals, stores, and sundries	21,379 0 3	Sundry stores	2,353 10
Deposits by consumers	15,697 16 1		29,459 17 8
Property-tax account	117 2 8		
Dividend account (outstanding)	264 11 5		
Balance of debenture stock account	0 16 7		
	£153,764 12 11		

The CHAIRMAN said: Ladies and Gentlemen,—The Proprietors of the three amalgamated Companies—the South Metropolitan, Phoenix, and Surrey Consumers—have practically met before; but from a business point of view this is really our first meeting, because the half year ending on the 30th of June last, was the first term that showed results of management grounded on the complete fulfilment of all interests. The Board was unanimous in its desire to find out all that was good in the working of each Company. We did so; and utilized it for the beneficial working of the present concern. The report tells you that it is impossible to make a comparison with the corresponding half of last year. All, therefore, that can be given you is a simple statement of the aggregate gas rental which is as nearly as possible identical for the two half years. This is owing to a reduction of 9d. per 1000 feet in the price of gas in the late Surrey Consumers Company's district which takes off just £10,000 from the half year's receipts. This £10,000 represents the actual increase of business, equal to about 3½ per cent., which is not unsatisfactory, following as it does on an abnormally large increase the previous year. The paragraph in the report, which is regarded with most satisfaction by the Directors, is the announcement that, from Midsummer last, the price of gas in the late Phoenix Company's district has been reduced from 3s. 4d. to 3s. per 1000 feet, giving uniformity of price under the scheme of amalgamation six months earlier than was expected. It is very satisfactory that we should have been able to bring about this result, because it simplifies the position of the "B" capital. One effect of this reduction proves the groundlessness of the fears entertained by some of those who opposed amalgamation on the ground that uniformity could only be produced by raising our 3s. standard price. This fear was through ignorance of the principle of the sliding scale, which makes it the interest of the Company to reduce the cost of gas, and imposes the penalty of reduction of dividend for advance of price. Another result of the reduction in the charge is to place all the "B" stock on one level for the future. Up to June 30 last the late Surrey Consumers Company's capital was entitled under the amalgamation scheme of last year to 1½ per cent.—which they will receive—while the Phoenix Company's capital, owing to the price of gas in their late district being then 3s. 4d. per 1000 feet will only receive 10½ per cent. Now by the reduction of 4d. in this last-mentioned district all the "B" capital, both Surrey and Phoenix, will in future be entitled to a dividend of 1½ per cent. if it is earned—and I hope, and have every reason to hope, that the next dividend after the one about to be declared to-day will be still better. The reduction in price that have allowed amalgamation diminish the revenue of the Company to the extent of £49,000 per annum. The public are therefore benefited to that extent. Simplicity, too, in the connection of the mains in the various districts enables the Company to efficiently supply gas at a lower pressure, and guards against failure of supply from any local accident. If in any part of the district there should be a deficiency of supply, the works in another part are now con-

nected, and the difficulty is got over. Next year a full account will probably be given of the large gasholder now in course of erection at the Old Kent Road works. The capacity of it is greatly in excess of any other holder in existence. That erected by the late Phoenix Company at Kennington is the largest at present. I am glad to say this new holder is getting on most favourably, and we hope it will be finished well within the time allowed the contractors. Its cost will be—tank and all complete—£47,000, or something under £9 per 1000 feet of capacity, the usual cost for smaller holders being about £18 or £20 for the same measurement. I conclude by moving—"That the report and accounts be accepted, and the report entered on the minutes;" and when this motion has been seconded your Directors will be ready to hear and answer any questions you may do us the pleasure of putting to us.

Mr. SIMPSON ROSTON said it gave him much gratification to second the motion. He was sure that any one who considered the exceptional character of the past half year's working of the Company must be very well satisfied with the inspection of the report, which filled the Directors with every confidence for the future.

The CHAIRMAN put the motion, and it was at once carried unanimously without discussion.

The DEPUTY CHAIRMAN (Mr. James Shand) then said: Ladies and Gentlemen, You have gone through half the business of the meeting, which was to pass the report and accounts. The next part is still pleasanter, for it refers to the dividend to be declared; and in the report which has been sent to you you have seen, as the Chairman stated, that they are enabled, if you see fit, to pay an increased dividend, with regard, at all events, to the "B" Shareholders. Of course, you expected when the last amalgamation took place, that some benefit would result not only to the public, but also to the proprietors. The result to the public has arisen, as the Chairman has said, and, fixing the price of gas from Midsummer last at 3s. per 1000 feet, and, best of mind, that very recently the price in one district was 3s. 9d., and in the other 3s. 4d. The public, therefore, cannot complain of the results of the amalgamation; and the sliding scale now comes in to our benefit, and shows the great advantage of such an arrangement, which was introduced to a large extent by your Secretary and Engineer. I may state that the "A" Shareholders, who represent the old South Metropolitan Company, could not be expected to come into the arrangement without some advantage to themselves. The Company had been charging 3s. per 1000 feet for some time, and beyond 1½ per cent. the "A" Shareholders receive a certain proportion more of the extra money than "B" Shareholders. Of course, there are various reasons why we look forward to being able to do this. One is in the economies effected. In consequence of the amalgamation the Board are reduced in number and less is paid for fees. Furthermore, two Secretaries have retired, and also two principal Engineers. There are other savings in other directions. For instance, the Chairman mentioned about the pressure. We are en-

abled to connect all our mains together, and the consequence is that we can send out the gas at a lower pressure than before, and this reduces the amount of leakage. There are other changes which will be made gradually, but which cannot be introduced all at once. I move—"That a dividend at the rate of 11 $\frac{1}{2}$ per cent. per annum on the 'A' stock and 10 per cent. per annum on the 'B' stock (late Phoenix capital) for the last half year be now declared, and that the warrants be sent to the Proprietors at their registered address by post." You may note that we are anticipating the date of this payment. As regards the Phoenix Shareholders, I have no doubt that they will be paid in full as previously, and possibly this may be hastened still more in the future.

Mr. HENRY FINLAY seconded the motion, and it was carried unanimously.

Mr. JOSEPH ROYLE observed that it was stated that in the future the "B" stocks would bear the same dividend, and he asked what they were to understand by this. One dividend was now 10½ per cent., and the other 11 per cent., what would the future dividend be?

THE CHAIRMAN: The future dividend will be about 11½ per cent. for both of the "B" stocks. We have been able to anticipate the reduction in the price of the gas in the old Phoenix district by six months, and this brings both the "B" stocks on the same footing.

Mr. G. D. GIBBES, in reply to a Shareholder, said that all the stocks of the Company were quoted in the official Stock Exchange list.

Mr. HOUNSON said there was one pleasant duty for the Shareholders to perform before they separated, and this was to thank the Directors. He moved—"That the best thanks of the meeting be given to the Chairman and Directors for their able management of the Company's business."

Mr. ROYLE seconded the motion, and it was carried unanimously.

The CHAIRMAN: Ladies and gentlemen, on my own part and on that of my brother Directors I beg to thank you for the kind way in which you have shown your appreciation of our efforts to manage the Company's affairs. I am quite sure that if everything goes on in future as at present you will have no reason to regret either that your interests are in an amalgamated Company, or that they are entrusted to those who are now managing it. We shall never cease in our efforts to manage your affairs in the best possible way.

Mr. R. H. JONES, J.P., moved that the best thanks of the meeting be given to the Secretary and Engineer, and the officers of the Company. He said he wished to point out that one of the advantages of the amalgamation was the lower pressure afforded, and the large amount of gas brought into charge. He saw that they had obtained 9200 cubic feet of gas out of every ton of coal carbonized.

The motion was seconded and carried unanimously.

THE SECRETARY AND ENGINEER: Mr. Chairman, ladies, and gentlemen, I am very much obliged to you for the cordiality with which this vote has been taken. I am sure that you will all be glad to put this meeting off so early a date—some six weeks before the usual time—they have been working very hard indeed. I refer more particularly to the gentlemen connected with the late Phoenix Company, and to the Accountant; and I am sure that you will all be glad to put this meeting off so early. I also say for the staff that all the members are working earnestly and devotedly for the benefit of the amalgamated Company. The principal officers who came over with the Phoenix Company are doing their duty, and I am sure that you will all be glad to put this meeting off so early. I need not say anything of the old people of the South Metropolitan Company, because I might be considered to be somewhat partial, but I may state at least as much for them. I have much pleasure in acknowledging

The proceedings then terminated.

READING GAS COMPANY

The Half-Yearly Meeting of this Company was held on Thursday last, when the Directors recommended that full dividends should be paid on all classes of stocks and shares. In regard to the Company's Bill in Parliament, which received the Royal Assent on the 2nd inst., the report stated the Directors have full confidence that it "will prove conducive alike to the prosperity of the Company and the good of the community."

It may be remembered that, among other things, the Bill which has just been passed into law was to authorize the erection by the Company of new works in the parish of St. Lawrence, and to form a road from near the entrance to their present works to the site of their proposed new ones, and to give the Company the right to take any land by bridge, concerning which the report says: "In order that the season for summer work should not be lost, the foundations for the new bridge have been put in under most of the most favourable circumstances, and the construction of the bridge and the making of the road have been proceeded with. The plans for the bridge have been already prepared by Mr. Baker, the Company's Engineer, and he has received the sanction of the Board, and is now very much interested in the work, and has passed the Standing Orders of Parliament."

The accounts presented were evidence of the continued prosperity and the satisfactory progress of the Company's business. During the past six months £593 was expended in extensions of works and plant; and £824 is charged for expenses connected with the new Act of Parliament. These sums raise the total capital expenditure to £85,354. The reserve-fund remains as before—£6000; whereas 1 per cent. for the half year on £78,000 was added to the contingency fund, raising it to £1221.

Dr.	Revenue Account, for the Half Year ended June 30, 1880.	Cr.
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Gas delivered	£5,342 17 0	Private gas—	
Supplying materials	104 17 10	State consumers—	
Salaries, &c.,	13 3 4	municipal gas, 69,294,860 cubic	
Wages	1,398 6 9	feet, at 3s. 6d. per 1000	
Repairs and maintenance of		cubic feet	£11,943 2 11
works and plant	1,06 3 6	Public lighting and	
Salaries of Inspectors, &c.,	52 4 0	contacts	851 5 2
Repair and renewal of mains			
and service-pipes	1,720 12 6		£12,694 8 1
Repairing, &c., meters	333 7 2	Residual products—	
Lighting, &c., public lamps . .	244 3 9	Coke, less loss	
Rents and taxes	558 11 10	hour	£1,025 7 11
Directors' allowances	123 0 0	Briquettes	23 17 9
Salary of Secretary and for		Tar	556 11 2
offices	125 0 0	Ammoniacal	
Collectors' commission	272 0 0	liquor	757 19 4
Stationery, printing, &c., . . .	75 4 2		3,563 16 2
General establishment charges	118 10 11	Rents	2 18 1
auditors' fees	123 0 0	Reserve-fund	94 9 4
Contingency-fund	390 0 0		
Bad debts	46 10 8		
Total expenditure	£13,314 13 0		
Balance	2,710 18 8		
	<u>£16,055 11 8</u>		<u>£16,055 11 8</u>

DEATH OF DR. WHITMORE.—We notice the announcement, in the obituary columns of the daily papers, of the death, on Wednesday last, of Dr. John Whitmore, Medical Officer of Health and Gas Analyst for the parish of Marylebone. The deceased gentleman was in his 70th year.

BARNET DISTRICT GAS AND WATER COMPANY

The Half-Yearly General Meeting of this Company was held on Monday, the 23rd inst., at the Gas-Works, New Barnet—Mr. J. F. BONTENS in the chair.

The SECRETARY and ACCOUNTANT (Mr. Alfred LASS, F.C.A.) read the notice convening the meeting, while the following report and accounts were taken as read:—

The Directors beg to submit to the Proprietors the accounts for the half year ending June 30 last,

The balance of the profit and loss (net revenue) account amounts to £4109 3s. 6d., out of which the Directors recommend the declaration of a dividend, free of income-tax, for the half year ending June 30 last, at the rate of 5 per cent. per annum on the "A" stock and shares, and 4 per cent. per annum on the "B" stock, leaving a balance of about £1100 to be carried forward to the next half year's account.

The gas rental for the last half year has amounted to £3378 9s. 1d., which shows an increase of £231 2s. 10d. on the corresponding period of last year. The water rental has amounted to £3082 15s. 10d., which shows on the same period an increase of £161 13s.

The price of gas has been reduced, as from the 25th day of March last, from 6s. to 5s. 9d. per 1000 cubic feet.

Dr. Gas Revenue Account, for the Half Year ending June 30, 1880.		Cr.	
Coal	£1312 18 5	Sale of gas—	
Purifying	62 17 1	Privatereatal	£4062 9 7
Salaries of Engineer, &c.	0 0 0	Public Light-	
Wages	299 8 0	ing	315 19 9
Repair and maintenance of works and plant	174 16 10	Rental of meters	£4378 9 1
Salaries of Inspector & Clerks	126 6 3	Residual products	110 3 2
Repair and maintenance of mains and services	148 8 11	Losses	620 16 11
Repairing & renewing meters	45 0 0	Receiv	16 12 3
Lighting and repairing public lamps	75 4 6	Tar	96 12 0
Rent rates, and taxes	61 17 4	Sulphate ac- count	88 41 6
Directors allowances	100 0 0	Rent account	822 13 8
Salaries of Secretary and Ac- countant	62 10 6		24 0 0
Collector's commission	100 6 8		
Stationery and printing	34 6 2		
General establishment charges	57 11 0		
Auditors fees	3 11 9		
Law charges	37 11 10		
Bad debts and allowances	41 13 3		
	<u>£2862 9 8</u>		
Balance to profit and loss ac- count, net revenue	2472 16 4		
	<u>£3335 6 0</u>		
			<u>£3335 6 0</u>

Da. <i>Water Revenue Account, for the</i>		<i>Half Year ending June 30, 1880.</i>		Ca.
Coals	\$264	13	3	\$3085 15 1
Wages	175	2	0	21 5 6
Repair and maintenance of works and plant	422	4	0	
Salaries of Inspector & Clerks	38	13	0	
Repair and maintenance of mains and services	62	1	8	
Salaries of Engineer, &c. . . .	87	10	0	
Rent, rates, and taxes	62	18	4	
Directors' allowances	100	0	0	
Salaries of Secretary, Ac- countant, &c.	62	10	0	
Collector's commission	44	11	4	
Stationery and printing	94	0	1	
General establishment charges	57	13	8	
Auditors fees	3	18	9	
Law charges	37	1	9	
Bad debts	50	8	2	
	<u>£1604</u>	<u>14</u>	<u>0</u>	
Balance to profit and loss ac- count, net revenue	1199	6	10	
	<u>£3104</u>	<u>0</u>	<u>10</u>	
				<u>£3104 0 10</u>

The Chairman said he supposed the first thing that every Shareholder would be getting in his report was to look and see what the dividend was to be, and on this occasion it was found that it was not proposed to increase it. Of course, the Directors would be glad as the Shareholders if the dividend was increased, but they were not prepared to do so. The dividend had increased on this occasion. They, therefore, proposed the same dividend as last time, and to carry forward a little larger amount to the next account. The second matter that a Shareholder would look at was to see whether the dividend had increased, and this it would be found had increased both as regards the dividend and the share price. The dividend had increased to £692. It might be thought, perhaps, that with this increase there could have been a small increase in the dividend, but on looking to the outlay of capital he thought they would come to the conclusion that it was not made sufficient to pay the dividends on the fresh capital that had been issued, and this was all they could well do on the present occasion. The capital used during the past six months—almost entirely on the water-works—had amounted to £17,385 from the commencement of the Company was now, gas-works £71,385, and water-works £73,603. As the Proprietors were aware, for some time after the amalgamation the prices of iron and coal were very high, but happily for the Company they had now been lower for some time past, so that the prices of the materials were now about two-thirds of the former moderate average in the price of these articles. Of course they would say they had always said, and as the Board had always agreed, that the amount of capital expended was very large, as compared with the amount of capital received, but they would say that the expenditure had been a deduction from this time more rapidly than it had as yet done. The amount of the capital expenditure was partly attributable to the fact that they were an amalgamation of three smaller Companies, but the fact was that they had to go to a distance of 12 miles to get their materials. If they went north from where they were assembled, they had 8 miles of gas-mains and 2 miles of water-mains; if they went south they had 3½ miles of gas-mains and 8 miles of water-mains; if they went east, they had 7 miles of gas-mains and 1 mile of water-mains; and if they went west they had 1 mile of gas-mains and 1 mile of water-mains. This was a large extent of mains, and was necessarily very costly. Of course, he had only given the mileage of trunk mains; for if they came to the actual mileage, taking all the side roads and streets in which their mains were laid, they would find that they had 12 miles of gas-mains and 58 miles of water-mains. This fact accounted very much for the large amount of capital expended. Ever since the formation of the present Company—the amalgamation of the three Companies—it had been the policy of the Company to have the best material, and to have the best material and workmanship of the best and to have the mains and the works on a scale suitable for the district they had to supply. He therefore thought they would very soon be reaping the benefit of their large outlay. The Company had been very much improved, and he thought they would have to the most satisfactory result in the new pumping works.

all or any of the annuities, and on such redemption the redeemed annuities are wholly extinguished. The old Water Companies and the Shareholders of the Annualities, by section 46, declared to be creditors of the Commissioners for payment of the annuities payable to them respectively, interest thereon, and expenses incident thereto, and are deemed to hold, by virtue of the Act, a mortgage and assignment of the whole property and works vested in, or to be acquired or constructed by the Commissioners under the Act, and of the several rates to be levied by them under the provisions thereof, in security of such payment. The mortgage and assignment thus constituted ranks *pari passu* with the other mortgages and assignments granted under the Act, and confers the like powers and privileges. The Commissioners were authorized to execute additional works by the Gaswork Corporation Water-Works Amendment Acts, 1866 and 1877. The total borrowing powers of the Commissioners under the Acts of 1869, 1866, 1866, and 1877 amount to £1,850,000. In the exercise of the powers conferred by these Acts the Commissioners, as at November, 1879, had borrowed on mortgage £434,221 15s. 4d., and have funded at 4 per cent. to the amount of £439,241. On April 30, 1877, the Commissioners resolved to fund £100,000, and on the 6th of April last they resolved to fund £150,000 additional, making £250,000 in all. Of this amount £108,500 had been either funded or arranged to be funded since November last, and on a considerable portion of the amount arranged to be funded a premium of 2 per cent. will be received. A large increase will, doubtless be made to the funded debt as mortgages fall in, and as the process of funding can be carried out with advantage to the Commission. The amount of the sinking fund at the date of the last balance of the water account was £164,735 3s. 5d. The total money borrowed, as at November last, thus amounted to £1,535,466 18s. 9d.

It was stated that these notes will form the basis for the Committee to proceed on; but they have not yet exhausted their remit. The whole matter will come up for consideration on the presentation of the report of the Committee.

EDISON'S "PERFECT LAMP" PERFECTED.

(FROM OUR AMERICAN CORRESPONDENT.)

Another *furor* in the matter of electric lighting has been created by the announcement that Edison has "perfected his perfect lamp;" and that is now roundly being discussed and commented upon in New York—or rather a portion of it by way of experiment—with his new lamp. Further, he claims that he will be able to make such a profit from supplying electricity for motive power that he can afford to almost give the light away, and thus at once consign gas companies to the things of the past, to run the risk of the competition of the new lamp. The Agents have lately been canvassing the lower business portion of New York, with the apparent object of ascertaining how many merchants and others would agree to use electricity for motive power and lighting purposes, if Edison were to establish the necessary works. The inventor claims to be very well satisfied with the result of the canvass, and that he has secured sufficient number of persons have pledged themselves to use his engines as to warrant the erection of suitable works, and that the money invested therein would earn a handsome dividend, even if, owing to the gas companies reducing the price of gas, he should be forced to supply electricity for lighting purposes at next to nothing.

When such statements as these appear in the daily papers on your side of the Atlantic, as they doubtless will, gas shareholders—I do not say gas engineers—are very apt to take alarm. I therefore take this early opportunity of laying before your readers an account of the so-called improvements in the Edison lamp, and in the supply of the motive power here, and I will also endeavour to see how much cause there is for any uneasiness on the part of gas men.

The improvements in the lamp are three in number. First, the hermetic-sealed globe containing the carbon horseshoe is made of ground glass, while the "perfect lamp" is made of clear glass. Second, the globe is thicker than the previous style; third, the carbon of the horseshoe is now of the same thickness as width. Let us consider these in the order named.

First, As the incandescent carbon loop, or horseshoe is of small area when compared with a gas flame, and consequently more dazzling to the eyes, the light may be a little more agreeable to the eye, but it is disagreeable—to the beholder when it is enclosed in its new garb. On the other hand, the ground glass will obstruct more light than the clear globe. This, however, Edison disputes, or at least claims that the new globe will only reduce the light 3 per cent., whereas the loss of light caused by a ground glass globe is usually placed at about 10 per cent. The inventor has two reasons to account for this discrepancy. First, that the electric light being a pure white light the rays therefrom will pass through the ground glass with very little loss, while the globe would greatly obstruct the rays from a gas-light; and, secondly, that the heat radiated, a gas flame is so great as to necessitate the use of a large globe, while his globe being so small—of smaller area—less light is obstructed by it. Now in regard to the first reason, it must certainly appear strange that no electrician has discovered it before (if there is any truth in it), when one of the great drawbacks to the use of large electric lights has been the necessity of surrounding them with ground or opaque globe, while advocates of the new lamp have always admitted that owing to this fact much lighting power is lost.

In regard to the size of the globe, that brings me to the consideration of his second improvement, and I would ask, if the larger area of a gas globe accounts for the difference in the percentage of the light obstructed, wherein is his larger globe an improvement? The difference between the size of Edison's new globe and those used for gas, cannot be very great, for I am confident all the "perfect lamps" I saw were 3 inches in diameter. Besides there is another thing to be noted in comparing his ground glass globe with these used for gas. The light of the light has to pass through the globe, while in the latter case a good deal of the light which is apparently lost, is reflected through the top and bottom openings. While the lighting of the ceiling is not a great gain, the light reflected down through the lower opening—especially in the new pattern globe with a 4 or 5 inch diameter—will be a great gain.

The third improvement is of some value, if it does what the inventor claims for it, viz., equalizes the light in all directions. It will be remembered that in the "perfect lamp" the carbon forming the loop was of greater breadth than thickness, so the light in front was greater than that transmitted laterally. Now making these two equal, the light of the light is the same on all sides. But if this had been the only defect in the former lamp, I think it would have come into general use before this.

What Edison proposes to do is simply this: To establish works down town, before the close of the present year, to supply electricity for motive power and light, the latter to be furnished at least at the same price as gas, never mind to what figure the purveyors of the latter article might reduce their commodity. The section of the city in which he proposes to commence operations is about a quarter of a mile square, being occupied chiefly by office-buildings and warehouses. In the greater number of the buildings gas is used for the passenger-carriage engines and for the other various kinds of work, but chiefly for heating the buildings in winter. So I do not think the new move will meet with a great deal of

success, even if the attempt is made. However, the inventor's plan, as before intimated, is to supply the motive power required in these buildings, and give the light as a sort of bonus. But it is to be noted that almost all the light used in this section—except that burned in the streets, of which he makes no mention—is that used in the daytime, in dark offices, &c., so he would have to provide the power to supply the engines and lights at the same time.

Of course, any figures emanating from Menlo Park are almost valueless for purposes of comparison. However, here is what is given. The candle power of the new lamp is placed at 154 candles—an improvement, according to the inventor's own figures, of 1 candle in the wrong direction. The globe to contain the carbon loop will be sold at 35 cents. (1s. 6½d.), and will last with ordinary care about six months. The number of lamps maintained per horse-power is given as 8, the plant necessary to supply 800 lights being as follows:—

100-horse power engine with one large generator	Dols.	£
Boiler, &c., &c.	4000	900
	1600	320
Total	5600	1120

The gas plant necessary to supply 800 lights is placed at from 7000 to 10,000 Dols. Land and buildings are presumably left out in either case, while the conductors from the works to the consumers—or perhaps better, users—premises are to be offset by the gas companies' mains.

In fact, Edison claims that where an electrical company would spend 1 dol. 74 cents (6s. 11½d.), a gas company would have to lay out 3 dols. (12s.).

Or had the inventor did not stretch it a cent, and make the former figure 1 dol. 69 cents. Many would not show a very great saving in favour of the price of his plant. A little further consideration will show how much larger the capital of an electric lighting company must be over a gas company's, more even than intimated in the foregoing figures, because the former company will need a large works and a large plant, while a gas company can build where land is the cheapest, and have one large works in place of several small ones. Again, the conductors would doubtless exceed the cost of gas-mains, as they would have to be of large size, insulated, and buried in pipes.

But it is a waste of time to attempt to form any comparison between Edison's meagre figures and the cost of gas; nor is it necessary, as the whole system of gas lighting whereby any amount of light, however small or however great, may be instantly and certainly obtained, so far exceeds anything Edison can possibly do with his light, that gas men have nothing to fear. For, even where the electric apparatus is in duplicate, if an accident should occur to the machinery the lights would probably go out before the extra engine could be brought into action, while with gas there is always a surplus to draw from, so that if anything goes wrong in the works the lights will still be burning. Again, the gas company has no interest in making a profit from supplying motive power, as they would naturally run his conductors only where he could get a large number of customers for his engines; consequently it would only be a limited portion of each city where he could at all interfere with gas companies.

But this his latest move shows the utter weakness of his case; and has been started, I think, as a means of raising the price of the Edison Company's stock, or else as a preparatory step to giving up all intentions of introducing his light, and diverting his mind to other matters. The gentleman is also very enthusiastic as to what he will accomplish in introducing his lighting system, and in the supplying of the motive power locomotives by the introduction of his electrical engines; but it does not come within my province to enter into details on this head, suffice it to say, he expects that locomotives will be placed aside, like gas companies, in a very few years.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

(Continued from p. 303.)

Mr. D. M. NELSON (Glasgow) read the following paper on

GAS PURIFICATION BY MEANS OF OXIDE OF IRON.

While the fact that the value of oxide of iron, as a coal gas purifying agent, is not sufficiently recognized in this part of Britain may serve to explain the reason for bringing it more before the Association, I feel that the subject would fare better in the hands of any other member more immediately engaged in the production of coal gas, and the arguments in its favour would carry conviction more readily to the minds of hearers. However, as a partial set-off to this, it may be proper to say at once that the substance of my remarks is based upon the experience of various members of the Association who have used oxide of iron in conjunction with lime, during a number of years; and continue to do so for the following reasons:—1st. On the ground of economy, as measured by the relative cost of purifying material and labour required to remove the impurities from the gas by it, as compared with the sole use of lime. 2nd. On the ground of collecting and utilizing the valuable product sulphur—the spent material containing it, returning, as it often does, fully the cost of the new material. 3rd. On the ground that by using oxide of iron in conjunction with lime, and utilizing alternate purifiers of alternate kind and rotation, the lime is fouled—chiefly as carbonate—and is restorable for an indefinite length of time, as in the lime revivification process of Mr. G. R. Hislop. 4th. On the ground that by the united application of oxide of iron and lime, the risk of having a short supply of purifying material at any time is very much lessened, and by restoring the lime by Hislop's process, everything is in the hands and under the control of the manager.

Chemically considered, the employment of oxide of iron and of lime in gas purification, is a beautiful adaptation of means to an end; they are both of them very simple and cheap, and they are both of them simple, which are at once intolerable to the sense of smell, and stifling to the lungs—that is, sulphuretted hydrogen and carbonic acid, both of which should be wholly removed, together with the major portion of the bisulphide of carbon, and this is accomplished perfectly and economically by the use of the both agents.

Thus, with a set of purifiers, marked Nos. 1, 2, 3, and 4, filled with

2	L.	Ox.	3
1	Ox.	L.	4

oxide and lime in the order shown, it will be seen that at one time the foul gas will enter the side first, and at another the lime. Supposing it enters the oxide first, then, just before turning off the purifier that preceded it (which would be, like, Nos. 1 and 2 would both have been

rendering the test-paper black, and thus indicate that a portion of the lime in No. 2 would be in the form of sulphide, and would be active in removing bisulphide of carbon; and, again, the carbonic acid, passing through No. 1 (oxide), and of course unabsorbed, would begin to discharge the sulphuretted hydrogen already absorbed by the lime, and send it forward to be taken up by No. 3, which is oxide. And, again, making the lime purifier No. 2 the first or foulest, when No. 1 is shut off, the carbon sulphide already formed and being formed will remove the sulphide of carbon, and the carbonic acid in the foul gas will complete the expulsion of the sulphuretted hydrogen lodged as described, sending it forward to the cleaner purifiers.

To carry out this plan, about equal quantities of oxide and lime are necessary, and should be placed in separate purifiers; otherwise they have to be kept carefully apart by means of canvas, which is troublesome and inconvenient. The finest Irish oxide of iron only should be used, as with inferior oxides a greatly increased cost is entailed in working it, on account of the more frequent changing of the purifiers for the necessary exposure and reactivation; otherwise a large purifying area must be provided. Again, it is more difficult to charge it with sulphur up to a marketable strength, as buyers do not care to take it under 40 per cent. of sulphur, but with good oxide it is easily charged with from 50 to 60 per cent.; yet to secure this it may be necessary to expose it to the air from 30 to 40 or more times, depending upon the amount of purifying surface available. It is always advisable to begin with a new batch of oxide at the commencement of the winter, and it can more easily be charged to the full extent during the lighter months of the year. In preparing new oxide for the purifiers, it is common to add from one-fourth to one-third of iron filings, said to be of little use. In practice it is usual to fill the purifier up on one tray, say 30 inches deep, and with the best results.

The cost of purification in the Paisley Gas-Works is: Purifying material, 0.254; wages, 0.204. = 0.458, per 1000 cubic feet of gas made—i.e., under 1d. per 1000 feet, and this is about one-third of the waste lime.

The above is a brief outline descriptive of the use of oxide of iron in the Paisley Gas-Works, while the experience in Dundee is somewhat similar, and may be explained as follows:—Sometimes the oxide is mixed with a little sawdust and sometimes not. In one lot recently used, about 8 per cent. of sawdust was mixed with the oxide, and the oxide was dry, and required to be changed once or twice before getting into good working order, but, if this is not the case, it will purify well from the beginning. After being fouled, the oxide is spread on the floor to revivify in a layer 9 or 10 inches thick. It is then turned over three or four times or often more, and is generally ready in five or six days on the floor. Then purifiers are charged with the oxide, and the waste lime, and the oxide is damped with water until it becomes about as moist as dry lime. The usual test is simply to take a handful, and should it be moist enough to retain the pressure of the hand without leaving any moisture, it is then considered as in good condition. Care must be taken not to make it too damp. It is in this state gathered into a heap about 4 feet high, ready for another purifier. Heating never occurs when the oxide is heated. After the oxide has taken in about 40 per cent. of sulphur, or over that, it is not necessary to damp it at all; the moisture that is in it when taken out of the purifier, is, to a certain extent, retained after reactivation.

Following this, it may be useful to submit a comparison of five years' experience of working with lime and oxide, and of working with lime and oxide of iron conjointly. My friend, who has experience of this, writes me as follows:—"In accordance with your request, I have great pleasure in giving my opinion as to the advantage of oxide of iron over lime as a purifying agent.

Gas Purified from May 10, 1869, to May 10, 1874.

50,806 cubic feet of gas purified in five years—	
1924 pounds of English lime used, at 4s. per boll	£384 16 0
Wages paid for labour for charging purifiers	42 18 0
Total	£427 14 0

Gas Purified from May 10, 1874, to May 10, 1879.

55,264,200 cubic feet of gas purified in five years—	
28 tons oxide of iron used, at 15s. per ton	£75 0 0
686 pounds of English lime used, at 4s. per boll	137 4 0
Wages paid for labour for charging purifiers	23 8 0
Total	£205 12 0

"The above shows about 50 per cent. in favour of oxide of iron over lime. I may state that the same class of coals was used in both cases. In working two purifiers, first with lime and oxide, and then with lime and sawdust, say 2 of oxide to 1 of sawdust, and water till it is at a proper dampness. This is known when the oxide keeps the form given when compressed lightly in the hand. This is the state that is found to work best. When charging the purifiers, the bottom tier is covered with lime, 3 inches deep, then the next two tiers with oxide, each 6 inches deep, then lime on the top tier 3 inches deep, and so on every time the purifiers are changed. When the oxide of iron gets fully charged with sulphuretted hydrogen, it is taken out and spread out, then it is watered well, to keep it from igniting. New oxide has a tendency to ignite when drawn from the purifiers, as purifiers are used, and it is not safe to return to the lime. To revivify the oxide, it is spread out upon the ground about 3 inches thick, and frequently turned over and watered to keep it at the proper dampness, as aforesaid.

"Its colour on being taken from the purifiers is much altered, and it is fit for use again until it has assumed a blackish or purple colour. It may be observed that the oxide upon which my calculation is based was at a very high price, and I believe with you that at the present time we can buy it at 30 per cent. less, which will have a still greater tendency to induce parties to give it a trial, and I can safely say if they used it once, they would be very reluctant to give it up and return to the lime.

"There is another advantage that the oxide has over the lime. When charged with impurities, it does not throw off that offensive smell, which is a necessary accompaniment of lime when used for purifying purposes." Beyond discovering the actual profit to be gained, I feel that I have done all I can for your aid, and I am sure that the information I have furnished in my paper, I cannot omit to record my thanks to Messrs. McCrae and Mitchell, of Dundee, Mr. Hislop, of Paisley, and Mr. Taylor, of Elgin, for the very valuable information they have afforded me of their experience in connection with the subject of purification by means of oxide as reduced in connection with lime—information so copious as to put, in reply to Mr. Terrace, he said his annual make was about 42 million cubic feet.

Discussion.

Mr. DALZIEL said he commenced using oxide of iron six months ago, and the result had been that his purification account had been considerably reduced. In connection with this, he mentioned the working of the oxide in reply to Mr. Terrace, he said his annual make was about 42 million cubic feet.

Mr. McGLINCHEST said what was the comparative cost per 1000 feet for oxide of iron and lime.

Mr. DALZIEL said it used to be 1½d., it was now 1½d.

Mr. MITCHELL said that oxide of iron was not used to any very great extent in Scotland, but it was extensively employed in the works with which he was connected. One reason why they had resorted to oxide was because of the difficulty they experienced in disposing of their waste lime; they could neither find a market for the quantity produced, nor anything like a price for that portion which was sold. Five or six years since they commenced to use oxide of iron; and at the end of their last financial year the cost of purification per 1000 cubic feet of gas made, including material and labour, was slightly less than 1½d. The cost of lime alone was 2-15ths of a penny, and the cost of oxide was about 1-15th of a penny. This calculation was made upon the basis of allowing quite enough for depreciation of the oxide. The oxide and lime together cost 3-15ths to 2-10ths of a penny, and labour 3-10ths, making the whole 1½d. per 1000 feet of gas made. He thought this would compare favourably with the cost of any other works. They used the oxide in two sets of purifiers, three in action in each set, and one out of action. In the first tray was put 5 inches of lime. Then there were two other trays, one with about 6 or 7 inches of oxide and one with 14 inches of oxide. The gas entered at the bottom, and ascended to the top; and this arrangement was the same in each purifier. Consequently the gas on entering passed through the lime, and the lime being fresh retained both the sulphur and carbonic acid until it became foul. After this, as he understood it, the gas parted with its sulphuretted hydrogen, as it passed through the two upper tiers. This process went on continually through the three purifiers, and the material was changed until the three above mentioned trays were full of lime, and the lime and oxide was objected to by some persons, from the fact that the oxide dropped through and fell upon the lime below to a certain extent; but the lime was so hard that the oxide was easily scraped off the top, and was then carefully riddled. Though a small proportion of the lime was mixed with the oxide, it was not noticed. The waste lime was changed using oxide in this manner; whereas the mode suggested by Mr. Nelson—to charge one purifier with lime, then one with oxide, and again one with lime—might do well enough at the outset; but the moment the centre valve was changed it was necessary to begin with oxide. They had used this plan in the first place, but was not successful, as the oxide was not right and fell back on the plan which they now adopted of passing the gas through the lime, and then through the oxide in each purifier.

Mr. SMITH: But still having three purifiers in action?

Mr. MITCHELL: Yes. Continuing, he said they found that with 40 per cent. of sulphur in the oxide, it had a tendency to break down work—it did not pass so well until the three above mentioned trays were full of lime. This was easier to sell if it had 50 per cent. Within the last two months they had adopted a mode of putting new life into the oxide, which had been suggested by Mr. Stevenson. This was done simply by adding 2 per cent. of ground lime shells, unslaked, to the oxide. A small quantity of lime was added to the oxide, and the oxide was changed. This was done into what one perceives that the oxidizing power of so small a quantity of unslaked lime was very great. Since they adopted this process their purifiers ran almost double the length of time with the same oxide as they did previously.

Mr. SMITH said he had used oxide of iron and lime for a considerable time, but had a decided preference for the latter. There was no purifying agent, he thought, like lime, and he would recommend its use if it could be easily disposed of after being fouled.

Mr. McGLINCHEST said he did not use oxide of iron; but believed that, where any difficulty was experienced in disposing of waste lime it would be much cheaper to use oxide, as it was quite as efficient a purifier. It was exclusively used in some works in the South, and it was being introduced in many places, at least to the extent of one purifier out of four, finishing off with lime. In certain places in the south of Scotland, however, where there was a great mass of lime on the spent lime, no benefit would accrue from introducing oxide of iron.

The PRESIDENT said he obtained as much for his waste lime as he paid for it fresh, and he had a great demand for it.

Mr. MacPHERSON said he was always of opinion that in passing gas through the oxide of iron the sulphuretted hydrogen was removed, and then in passing it through lime the carbonic acid was seized. He would like it explained why at Dundee the gas was first passed through lime.

Mr. MITCHELL said that their reason for placing the lime next the gas was that, having a greater affinity for carbonic acid than the sulphuretted hydrogen, it quickly removed the former from the gas, and then the oxide of iron, having a greater affinity for the sulphuretted hydrogen, than for carbonic acid, took up the sulphuretted hydrogen. This process went on until the lime became foul, when it parted with its sulphuretted hydrogen, and this compound was retained by the oxide.

Mr. MITCHELL: Then, why not use the oxide first?

Mr. MITCHELL said the mode he had described seemed the most natural way of doing the work.

Mr. MacPHERSON: You have explained that the oxide combines with and removes the sulphuretted hydrogen. Why not do this at one operation by first passing the gas through the oxide of iron, and then leave the lime to deal with the carbonic acid?

Mr. MITCHELL said it would seem that the mode of placing the lime first was preferable.

Mr. McGLINCHEST stated that Mr. Hislop instituted a series of experiments in Paisley, at this point, and found that there was no advantage in using the oxide before the lime, or the lime before the oxide, and in working his purifiers, he turned on the gas to the oxide and lime alternately.

Mr. MacPHERSON said that was his opinion, only he wanted to know whether it was the case of using the oxide before the lime in Dundee.

Mr. WIMMERER said for seven years he had worked oxide in combination with lime, and had always understood that if gas was passed through oxide of iron first it broke up the union between carbonic acid and sulphuretted hydrogen, retained the latter, and then allowed the lime to complete the work. If the carbonic acid was first, the waste lime and lime at the end it would pass away with the gas. As between lime and oxide of iron he had known little difference so far as bad smell was concerned. In fact, if anything, he would prefer lime in this respect, because lime was oxidized in a short time, and the small quantity of oxide of iron kept on oxidizing through its mass from day to day, and the result was that it was a greater nuisance in the neighbourhood than foul lime. He had ceased to use oxide for various causes. He could not see that it was much profit to him, as he obtained 2s. per cartload for waste lime; but apart from this he thought the cost of the waste lime, as purchased from agents, was nearly as possible as lime.

If anything the oxide was the cheaper of the two.

Mr. MacPHERSON said that all that he wanted to know was the reason why lime should be used first, because he was aware that the ordinary process in England was to put the oxide first. He held that there was no advantage in using the oxide before the lime.

The PRESIDENT said he always understood till lately that the ordinary process was to pass the gas first through the oxide, and complete the

process by sending the gas through time; but upon this, as upon almost every other subject, there was a difference of opinion. He thought Mr. MacPherson might well set himself to prepare a paper on the subject for next year's meeting.

Mr. F. T. LINTON (Leith) submitted the following paper, which was read by the Secretary:—

NOTES OF THE COST OF WORKING A GAS-ENGINE, COMPARED WITH THE SAME WORK DONE BY STEAM POWER.

It may perhaps be as well to explain that in the remarks which I have the honour to lay before you, I do not purpose going into any description of the principles of construction of the various gas-engines now in the market; I have no doubt that the members are conversant with these affairs, from the various communications of late years on the subject, and especially the very able paper read last year by Mr. Carr, of Halifax, before the British Association of Gas Managers. My desire is simply to put before you what my experience has been of a gas-engine which was erected at the works of the Edinburgh and Leith Gas Company in the spring of last year, and I suppose that my brother managers, like myself, are being frequently applied to for information and advice as to these engines. I thought that if I put together a few notes as to the cost of working our gas-engine, with a comparison of the cost of doing the same work by steam power, it might be of some little service.

The engine in question is a gas-engine of 31 nominal horse-power. It is employed for three smiths' fires, and to drive various machines in our workshops—such as a "Roots blower," a large screw-cutting lathe, a screwing machine, a drilling machine, a circular saw, two smaller lathes, and two grindstones. The amount of power required varies considerably, and the time these machines may be in use, and at another time not more than two of them. In all cases, however, the smoothness and regularity with which the engine works is very noticeable; there being no sensible diminution or acceleration of speed as the different machines are put in or out of action. The attendance required is very slight. The engine can be started in a minute's time, and the lubricating being done by an ingenious self-acting arrangement, no further attention is needed till the engine requires to be stopped, which is done instantly by shutting off the gas. The only other labour needed is to examine the slide valves once a week to see that the passages to the cylinder are clear, and this does not take more than 15 to 20 minutes.

There is a water cistern in connection with the cylinder jacket, for keeping the cylinder cool, but I have found that the amount of water required, after the first filling of the cistern, is practically nil, as the temperature of the water has never risen so much as to require a stream of fresh water run in; the rest during most hours and at night being sufficient for cooling the water down to the atmospheric temperature. Were the engine, however, working continuously—as in driving an exhauster—a small stream of water would be necessary, and would have to be taken into account in estimating the expense of an engine for such a purpose.

The cost of the engine for the year, from May 15, 1879, to May 15, 1880, working 87 hours per week, has been as follows:—

Gas for engine and slide lights, 99,000 cubic feet, at 4s. 3d. per 1000 feet	£30 12 6
16 gallons of oil for lubrication, at 3s. 6d. per gallon	2 16 0
Attendance—about one hour per day, at 4d. per hour	5 4 0
Making total of working expenses	£38 12 6

The first cost of engine and cistern complete was £170, and the annual tear and wear may be taken at the rate of 7½ per cent., or	£11 18 0
Depreciation, the same	11 18 0

Making together	£23 16 0
Add to this working expenses above	28 12 6

The total charge for year will be £52 8 6

The amount of the working expenses would necessarily vary with the varying price of the different materials, and the fluctuating selling price in Edinburgh and Leith last year; but, of course, the actual expense, where it is used in a gas-works, will be not the selling, but the cost price of the gas.

As regards the percentages charged for tear and wear and depreciation, these are, of course, entirely dependent on the well-finished and substantial style in which these engines are got up, the absence of complicated working parts, and the large bearing surfaces of the parts liable to be worn out.

The amount of power derived from the above expenditure has been on the average at 2-horse power. As explained before, the use of several of the machines is intermittent, but it takes about 1½-horse power to drive those that are constantly in use, and the addition of 1-horse power to the average for those that are used occasionally (including, as they do, circular saw of large size, and a heavy screw-cutting lathe) is a very moderate estimate. This works out to an expenditure of about 17 cubic feet of gas per indicated horse-power per hour, which is much below what is stated to be used when the engine is worked with a full load, and seems to bear out what was stated by Mr. Carr in his paper last year, that, contrary to what might be expected at first sight, the engine works most economically when not used up to its full power.

The cost of a steam-engine and boiler of 31 nominal horse-power, and equal in respect of workmanship to the "Otto" gas-engine, would be about £110, and the usual allowance for tear and wear and for depreciation would be 10 per cent. per annum for each on an engine and boiler of this size. This estimate is 7½ per cent. for the gas-engine is not at all excessive, as, of course, the boiler involves more tear and wear. The working expenses would be as follows:—

For fuel, at 8s. per week for 52 weeks	£20 16 0
Wages of attendant, at 12s. per week	31 4 0
Oil for lubrication—same as gas-engine	2 16 0
Water supply for boiler	2 10 0

Making total working expenses	£55 6 0
Add for wear and tear, 10 per cent. on cost	11 0 0
And depreciation, the same	11 0 0

Making total charge for year £77 6 0

It will be borne in mind that the cost of fuel will be more or less than what is given above, according to locality, but it is a fair estimate, checked by actual experience of the working of the small steam-engine and boiler in our works, and by comparison with what it costs various users of similar engines in the neighbourhood. The wages of an attendant I have taken at 12s. a week, and I have allowed 6s. off that, on the supposition (which in many cases, however, could not be realized) that the man would devote so much of his time to other work.

The general results, then, are as follows:—

Working expenses of gas-engine	£28 12 6
Ditto of steam-engine	57 6 0

And taking tear and wear and depreciation into account, the total annual charge would be—

For gas-engine	£52 8 6
For steam-engine	79 6 0

£26 17 6

The advantage is therefore largely in favour of the gas-engine, and I venture to think that if I have erred at all in the comparison, it is in under, not over estimating the cost of the steam-engine. I have also to point out that our engine is constantly going during working hours. There are, however, an infinite number of cases where power is needed only at intervals, and in such cases the comparison would be still more in favour of the gas-engine.

In all cases where we have supplied gas for these engines, the testimony of the users has been highly in their favour, and, not long ago, one gentleman gave me his experience as being that, when he had a steam-engine, it cost him 18s. a week for wages to the attendant, and from 10s. to 12s. a week for fuel, but that now his cost was from 4s. to 5s. a week for gas, and no attendant needed.

In addition to the saving in cost, however, the gas-engine has other advantages. It occupies small space; it is always ready at a moment's notice; does away with the risk and danger of explosion, thereby reducing cost of insurance, and allowing insurance to be effected in places where, with a steam-engine and boiler, the companies would not undertake it; it also needs no special building, or chimney, and does not make the presence of the engine so uncomfortable with heat, dust, and cinders. One drawback it has, not as regards those who use it, but as giving trouble occasionally to gas managers—namely, that the action of the engine causes an oscillation of the lights taken from services immediately adjoining that of the engine, when the main pipe is small, say under 4 inches diameter. I can only say, therefore, be always taken from a large main where practicable, or at any rate no other service should be taken from the main (when it is less than 4 inches diameter) in close proximity to that for the engine. I may also note that the pressure of gas in the main must be at least equal to that of 7-10ths of an inch of water.

That gas-engines will be very long come into extensive use, I think certain; not only as supplanters to some extent of steam-engines, but also as affording a cheap and efficient motive power in a great number of places where the use of steam is difficult or impossible. It is obviously the interest of gas companies and managers to forward their employment as much as possible, because they not only increase consumption of gas, but, by using it chiefly during the hours of daylight, no corresponding increase of capital expenditure is involved; and their extensive use would not only benefit gas companies, but gas consumers in general, by reducing the cost of manufacturing the gas.

Discussion.

Mr. WHIMSTER said he erected a gas-engine at the end of an entry in Perth, and as there were several service-pipes in the locality, the supply was taken from one of these; but to his chagrin, when it commenced to work, complaint came south from all directions. Various schemes were tried to remove the ground of complaint, but ultimately he was compelled to put in a service-pipe specially for the engine.

Mr. SMITH said there were a good many gas-engines in Aberdeen in connection with lifts, and he never heard a single complaint about one of them.

Mr. WHIMSTER said the principal complainant was a man whose house was rather dark, so that he had to use a good deal of gas during the day-time.

Mr. DALZIEL said he put in a 3-horse power gas-engine at Kilmarnock, and the pleasure to which it afforded had been very great, independent of the service to the engine; but he never heard a complaint about the engine. They gave about 7-10ths pressure during the day.

Mr. MITCHELL said that with one engine in Dundee, when the service-pipe pressure from the main did not exceed 16-10ths the oscillation was great, and they were obliged to put in a separate service for the engine. In another case of a 16-horse power "Otto" engine which had been placed in a large warehouse at the dock for lifting purposes, it was found on connecting the 3-inch service to the engine that they were unable to give anything like a proper supply of gas. They in this case had to lay a 3-inch pipe from a 14-inch main, and the works before the gas passed through the governor, in order to give 3 inches pressure for the engine. Although it was possible to supply enough gas for the working of the engine by this arrangement, a separate service had to be laid to the place for the ordinary lights on account of the oscillation caused by the working of the engine.

Mr. McGUIRE thought that what had been stated did not in any way tend to encourage the use of gas-engines, at all events if they required 3 inches of pressure and special services laid, in the way that had been indicated.

Mr. MITCHELL said the parties he mentioned paid the whole expense of the services. Besides, if the large engine had been situated farther up the town there would not have been any necessity to lay a separate service—they could have given, say, 18-10ths of pressure from the works, and so would not have required to lay an independent supply-pipe.

Mr. MACPHERSON: Where, then, was the necessity of giving 3 inches of pressure?

Mr. MITCHELL said there was no other way of getting the thing done, because the ordinary means had failed, and they had no alternative but to give the gas before it passed through the station governor.

Mr. MITCHELL said that if they were to pay attention to the fittings of the pipes in connection with the 16-horse power engine—whether they were (as sent by the maker) amply sufficient to provide a 3-inch supply, or were they so small that they would require more than 16-10ths of pressure to force the gas through? He did not see, if a 3½-horse power gas-engine could be supplied from an ordinary service with 16-10ths of pressure, that a 20-horse power engine could not be supplied if the pipes were of sufficient size.

Mr. MITCHELL said in practice it was clearly brought out—whether it was the pressure, or the sucking power of the piston—that oscillation at a distance of 200 or 300 yards was experienced. He could not give the size of the pipes from the meter to the engine, but the connections at the engine were as large as those at the meters.

Mr. WHIMSTER said he found the connections of the engines were made very small.

Mr. MITCHELL asked what quantity of gas was used per hour.

Mr. MITCHELL: About 300 cubic feet.

Mr. MACPHERSON was inclined to think the whole difficulty lay in the connections. A pressure of 16-10ths was sufficient if there was the size of pipe sufficient to convey the amount of gas needed.

Mr. SMITH thought the makers of gas-engines ought to remember that

gas managers did not work with more than 4-inch of pressure during the day.

Mr. TRACER said he was pleased that the paper of Mr. Linton had led to such a useful discussion. He explained that in Edinburgh a rule was made that there must be 40 feet of pipe between the meter and a gas-engine. In a particular case, however, he knew of the engine which was an oil engine and a horse power engine—both of which were connected to the meter through which the gas consumed in the office passed; but the same service from the main supplied both meters. This engine cost 1d. per hour for gas, and required to be cleaned once a week when in constant use. In consequence of the arrangement to which he had referred there was not the slightest oscillation. He was very much of Mr. MacPherson's opinion as to the supply for a gas-engine, that it was a mere question as to the size of the main, and not one of pressure or distance. The size of the main must be commensurate both with the distance and the pressure. He thought that the need for 3 inches of pressure might be obviated by increasing the size of the service. In Arbroath there were three of the "Bischoff" engines at work, and although they only gave 7-10ths of the day pressure no difficulty had ever been experienced. If there were any oscillation the lights would be affected in the printing-office where one of the engines was used.

A vote of thanks to Mr. Linton for his paper was then passed.

(To be continued.)

SOME NOTES FROM AMERICA.

(FROM OUR OWN CORRESPONDENT.)

The Engineer of the Cleveland Gaslight and Coke Company (Mr. G. H. Hyde) has recently made some experiments relative to the candle power of the electric light, to which I will briefly refer. The light being burned on was a Brush lamp, rated at 2000 candles. A Bunsen plant was used, the size of the service in Arbroath, and the light, being built expressly for the purpose. The electric light in a plain glass globe was compared directly with a test candle; and 80 observations were taken, the observed candle power of the light ranging from 607 to 176, while the average corrected power was only 383 candles. Mr. Hyde informs me that the most correct conclusion from the conduct of the experiments. If these tests be accepted as conclusive, it is certainly another proof of the excessive power attributed to the electric light. It may be open to doubt whether such a trial as this, wherein there is such a great difference between the light experimented on and the standard used, is absolutely correct, but it certainly cannot be far out of the way.

Montreal Harbour Commissioners are now in the process of the electric light for illuminating the wharves, and thus facilitate the loading and unloading of vessels at night; the light giving great satisfaction. A prominent seafarer of the city says of it, that the men can work as rapidly and as safely by its aid during the night as through the day. The number of lamps put up so far is 16, and the Brush engine, of large size, produces the electricity, while the length of the circuit is between 11,000 and 12,000 feet—probably the longest circuit in this country. The cost of running the 16 lamps, including wear and tear and interest on the investment, is said to be 8 cents (4d.) per hour per lamp. If the City Authorities decide to add to the present number of lamps, the total cost of the light will be extended by the addition of 32 more lights, and the single burners now used will be changed for double ones working automatically, by which means the light may be continued for 16 hours at a stretch. If the cost of the light—8 cents per lamp per hour—be correct, it is certainly very little; I think, however, that it will eventually be found that this figure is too low.

Another novel experiment in electric lighting is shortly to be made. This time the scene is to be laid in Holyoke, a town in Massachusetts. Professor Spaulding, of Boston, is to erect a tower 176 feet high, and place there an electric light of 100,000 candle power, and he expects to flood with light the part of the town adjacent to the tower, that other lights will be unnecessary either indoors or out. This one light he will put up at his own expense, and expects to make such a success of it as will warrant the Town Authorities erecting six more, which he claims will be the first time in the history of the world that one light will be used to flood air above the city with light of such intensity as to permeate all space, and convert night into day. I fear the professor will be a poorer man before he has finished his experiment.

It now appears that the only obstacle to the complete success of Edison's light has been the impossibility of procuring a sufficient quantity of gas. Now, however, a 100-horse power engine is being built in Philadelphia for the inventor, which is to be capable of making 600 revolutions a minute. When this engine is put in operation the troubles of Menlo Park are to cease.

A charter has been granted to a Company in Philadelphia to manufacture and sell electricity for illuminating purposes, and to make the necessary lamps, &c. As the capital of the Company is to be only 50,000 dols. (£10,000), they cannot have very extensive aims.

The Holland Hydrocarbon Retort is a name given to a recent invention by which it is proposed to furnish heat, light, and power. The retort is made in different sizes, according to the work required of it; the smallest ones being about 8 inches long, 6 inches high, and 6 inches wide. A partition separates the retort, which may be placed in the fire-box of a cooking-stove, one section being connected with a naphtha tank, the other with the supply of water. The heat, which is obtained by lighting a small quantity of naphtha in a cup under the retort by which means gas and steam are generated. These burning together under the retort are supposed to supply the heat for the continued generation of the gas and steam, and also, where desired, furnish heat for cooking, &c. When it is required to make gas for lighting purposes the retort is so arranged that the number is needed, and the outside pipe of the gas is led back and forth against the retort, in order to make it a "fixed gas." A dry scrubber and a holder complete the apparatus. I have given you a brief account of this invention, not that I think it will ever at all militate against the interests of the gas supply, but because it is a very novel and interesting method of producing naphtha into their kitchens—but in order to give to your readers a true account of its workings, as some papers are inclined to puff it considerably. It is also proposed to use the retort to generate steam on locomotives, and the patentee claims that he will be able to run them at from 3 to 4 cents. (1d. to 2d.) per mile, which would be a great saving over the present expense, which is about 10 cents. (5d.).

As the subject of heating retorts by means of regenerative furnaces is claiming a good deal of attention at present, especially on your side of the water, it may be of interest to note what is being done by way of an experiment at the Metropolitan Gas Works, in London. In the first place, the matter, two benches were fitted with Liebig's furnaces, but as they are not separated from the other benches, the result cannot be given in figures, but the Engineer of the works informs me that there is considerable saving of fuel, a greater simplicity of working, and much less labour required in attending to the fires; and, in the case of the latter, no heating necessary, as the clinker runs off as a flux through the slit. This reduces the labour to a minimum, the fireman having only to feed the furnace with fuel, and keep the slit clear, which is an easy task, it only being

necessary to run the rake through it every few hours. Another feature in favour of this system of heating benches is that the ashes and dirt do not make their way into the flues and obstruct them. As a practical proof of the satisfaction these furnaces have given this Company, I would mention that they are just now constructing 20 more. I hope to be able to lay before your readers at a future time some data as to the result of their use in the latter.

There does not seem to be much doubt of the success of the regenerative furnaces applied in large works, for all the trials so far have shown a decided saving from their use; but the question as to the practicability of their adoption in small works is one yet to be determined. Thanks to the pluck of the Superintendent of a small gas-works in Connecticut, the problem is in a fair way to be solved. At the works referred to, where the average make is about 25,000 feet a day, one of Dieterich's furnaces has been built, and will probably be fixed during the coming fall. This trial is one of more than ordinary importance, as the number of small works is great, that if the regenerative furnace is found to be a success in this instance, there are hundreds of works where it may be applied with reasonable hope of its being a lucrative investment. In small works, as a general rule, a less number of retorts are set to a bench than in large works, so we would naturally expect the saving in the former to be less than in the latter.

Yonkers is a town of about 20,000 inhabitants situated on the Hudson River a few miles from New York. The gas supply of the town is certainly getting in a very confused state, having the doubtful blessing of two Gas Companies, which have been indulging in the expensive business of trying to ruin their opponents. So determined are the two Gas Companies, that they sold their gas for a mere nothing. Eventually seeing they were mutually ruining one another, they effected a compromise, divided the town into two sections, and each Company kept to its own district. On the 1st of May the Westchester Company, which is the newer concern, complained to the Yonkers Company that they wished to discontinue the agreement formerly entered into; at the same time accusing their rival of stealing gas from their mains, for which the Westchester Company have used their opponents, claiming 1000 dols. damages. Thus chaos reigns again, and the condition of affairs will not be improved when the new retorts are being built by the Yonkers Company to supply Strong's heating gas as put in operation. This latter Company expect to supply gas for heating purposes at from 50 to 75 cents (2s. to 3s.) per 1000 feet.

Gas affairs might be somewhat complicated if the formation of companies for supplying heating gas were to become general. If the price of coal gas can be reduced, however, it would be little to fear in this direction. Improvements are called for in the process of gas making, should be thoroughly examined and the fact determined, whether they are improvements in truth or only in name. At the present average price of gas, say 3 dols. 25 cents. (9s.), Strong's gas at 75 cents. (3s.) is cheaper for cooking purposes; but it is said that coal gas can be reduced somewhat, there is little doubt that the two companies will have to wait a few years before they are kept as busy in the daytime as at night; for the heating effect of Strong's gas is 8750 units, while that of coal gas is 22,000 units, making the latter gas about two-and-a-half times more valuable as a heating agent. It is claimed for the Strong gas, as now made, that it has an odour, but the gas is pure, and the odour is only a result of the admixture of gas in dwellings might be attended with some very serious consequences.

A fire occurred at the Coney Island Gas-Works on July 30, but it was not of a very serious nature. Some barrels of tar took fire, making a very dense smoke, and thus creating a good deal of alarm, but doing comparatively little damage.

The private gas-works at Bergen Point, New Jersey, built to supply the large hotel at that place were entirely destroyed by explosion and fire on Tuesday, the 3rd. inst. The gas-house was a brick building, about 15 ft. by 20 ft., containing the apparatus for making oil gas, and a boiler 8 ft. in diameter and 10 ft. high. As it seemed that the explosion would not still allowed to generate. This, escaping from underneath the holder, soon filled the building with an explosive mixture; while the only other thing wanting, a fire, was burning under the retorts. The roof was thus very soon blown off, and the entire works destroyed. Gas men were luckily prevented from entering the works, as the explosion occurred at a time when the same building; and always to have a competent man to oversee the gas-making.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The price of gas has been reduced by the Forres Gaslight Company 5d. —from 7s. 6d. to 7s. 1d. per 1000 cubic feet.

On Thursday last the Shareholders of the Penicuik and District Gas Company, Limited, held their fourth annual general meeting—Mr. James Birrell, of Uterhill, presiding—when the Secretary, Mr. Thomas F. Weir, S.S.C., Edinburgh, submitted the report of the Directors for the year ending July 1, 1880. It stated that the price at which gas was supplied during the year was 5s. 10d. per 1000 feet, and that the Directors proposed to divide among the Shareholders a free dividend of 6 per cent. on the amount of paid-up stock, which would absorb £360, and that the balance of revenue would be carried forward as a fund for depreciation and extension of works. The report was unanimously approved of, and Messrs. Henderson and Russell were re-elected Directors, and Mr. Brown Auditor.

The Forfar Corporation Gas Committee now have their new gasholder finished and into position, its height being 36 feet, in two lifts, and borne by eight columns 38 feet high. The erection was pushed on so as to get the work completed before the winter should set in, and all the necessary tests were made. The upset price of the gas is to be 5s. 10d. per 1000 feet of water to fill the tank; but the summer has been so dry that, pending the completion of the new water-works, the existing town supply will not admit of the necessary quantity being had from that source.

At the annual meeting of the Stewart Gaslight Company, which was held some days ago, Mr. James Love presided, and a dividend of £1 was declared on the original £5 shares, and the balance of profit was carried to the rest fund. The vacancies in the directorate were filled up, and the Collector and Treasurer were appointed pro tem. The meeting, which was thinly attended, broke up rather abruptly, without passing the usual resolutions. There was some talk of reducing the price of gas 5d. per 1000 feet.

On Thursday afternoon, in the County Hotel, Paisley, Mr. James R. Macfadyen exposed for sale thirty shares of the Paisley Water Company, and shares to the amount of £200 of the gas annuities. The thirty water shares were sold at the upset price of £185 to the satisfaction of the bidder, and the 30 gas annuities were sold at £155 each, and one of them realized £158 10s., the other being purchased at £159.

Business was done last Thursday in the Edinburgh Gas Company's stock at 447, and on the preceding day in the Edinburgh Water annuities at 147.

In consequence of the anticipated running short of the Ayr water supply, the Water Commissioners fully a fortnight ago found it necessary to cut off the supply for six hours during every night. As the water in

the reservoirs still continues to diminish, it was found expedient last week to issue notices intimating a still further curtailment of the supply sent into the town, and no water will, until further notice, be obtainable between the hours of 8 p.m. and 6 a.m. Should the present drought continue a very serious diminution of the water supply will have to be met, and in view of this the Magistrates have issued an urgent appeal to the inhabitants not to waste the water. This unfortunate state of matters is the consequence of the accident to the new reservoir, which, had it been ready at the time intended, would have supplemented the present supply by 120 million gallons.

At the last monthly meeting of the Greenock Water Trust, the Superintendent submitted his statement of water in store, from which it was found to amount to 238,422,523 cubic feet, being equal to a supply for 76 days for all purposes. At the same meeting the rate of assessment for the ensuing year was fixed at 8d. per £1 of rental for domestic purposes; 1½d. per £1 for public water-rate; and the rate for extended boundary for water used for domestic purposes, 1s. per £1, with 10 per cent. added for water used for other than domestic purposes. The expenditure was estimated at £25,125, and the income at £23,371 14s., including last year's surplus of £227 14s.

An inspection of the new water-works at Wornit for Newport-on-Tay was recently made by the Dundee Water Commissioners, when it was found that they were in every way satisfactory.

Cupar Water-Works were recently inspected by the Police Commissioners of the burgh, who indulged generally in congratulations on the satisfactory condition of the works. Since then they have sat as Water Commissioners to fix the assessments for the ensuing year. The rate payable by owners of accommodation is fixed at 1½d. per £1, and the rate of rental—the charge being 6d. per £1 and 1½d. per £1 respectively; and the domestic rate was fixed at 1s. 5d. per £1 of rental.

When the Burntisland Water-Works were officially inspected on Wednesday week, there was found to be in store equal to a supply of 115 days, and, notwithstanding the dry weather, the new reservoir had received 250,000 gallons per day to the town, and a similar quantity of compensation water.

There was a severe drop in prices last week in the Glasgow pig-iron market, and a very large amount of business was done. The highest price was 55s. 6d. which was paid on Monday, and the lowest was 53s. cash, paid on Friday afternoon.

No material change has taken place in reference to the miners strike. Prices of coals are firmer, and in some cases advanced.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of this district continues extremely dull, and colliery proprietors are waiting for a more generally considered case of the winter months of the year, house-fire coals being in little or no demand, whilst the numerous "wakes" and other holidays throughout the district interfere considerably with the requirements for manufacturing classes of fuel. The pits, as a rule, are still only working about half time, and sales of all classes of coal are consequently slow.

In the gas coal trade there are now very few inquiries for anything like quantities, most of the important contracts in the district having been either already settled or the tenders have been all sent in. Where, however, any inquiries have been quoted for it is at very low figures, and the average prices at the pit's mouth may be given at about 6s. to 6s. 6d. per ton for best screened gas coal, and 4s. 9d. to 5s. 3d. for inferior sorts, such as Wigan four-feet mines. Good ordinary canal is being offered at the pit's mouth at from 12s. 6d. to 14s. 6d. per ton, although for the best Wigan canals considerably higher prices are asked.

The better qualities of iron are scarce and firm in price, but there is an abundance of the inferior sorts in the market, and burgy is also tolerably plentiful. Good slack fetches about 3s. 6d. per ton at the pit, and good ordinary burgy about 4s.; but common sorts are to be bought at 6d. to 1s. per ton under this.

Shipping continues very quiet. A fair quantity of coal is being disposed of for steamers used locally, and a few cargoes are going away to Ireland and to Russia; but in the ordinary shipping trade there is very little doing, and extremely low prices are still taken.

Coke remains in very poor demand. The average quoted prices at the pits are about 12s. per ton, and for the best quality, but best Lancashire worked coals are being sold at as low as 11s. per ton at the ovens.

There has been very little doing in the iron trade during the past week, but neither in the local nor the district brands at present coming into this market are any lower prices being taken. Lancashire pig iron delivered at the Manchester, Derbyshire, and Yorkshire works is at a rise of more than 3d. per ton of freight, and that was very temporary; for, after immediate requirements were met, they fell back to their old condition. At the present moment merchants and colliery offices are rather anxious to have selling ships at their command in the gas trade. Where possible steamers are employed in carrying timber and other produce from the Baltic to the United Kingdom. At the same time there is plenty for coasting purposes, and rates there are very little changed. Whilst there is undoubtedly more business transacted at the collieries, there is little, if any, alteration in the price of gas coals. It is not likely to occur. Steam and house coals are moderate in price. There is a little more inquiry for manufacturing coals for shipment, as is usual at this time of the year.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The more active shipping business always noted in connection with the gas coal trade of the Tyne in the last week in August has commenced. The coasting trade had been dull for months. Last week a demand came up for carrying slabs and other goods for the Continent. Several vessels were engaged, while more are required after; and it may be expected that September will show considerable results in the shipments of gas coals not only to the southern ports, but to the Baltic. The rate of freight is not affected so far. Even last week, when there was a scarcity of handy sailing tonnage on the Tyne and Wear, there was a rise of more than 3d. per ton of freight, and that was very temporary; for, after immediate requirements were met, they fell back to their old condition. At the present moment merchants and colliery offices are rather anxious to have sailing ships at their command in the gas trade. Where possible steamers are employed in carrying timber and other produce from the Baltic to the United Kingdom. At the same time there is plenty for coasting purposes, and rates there are very little changed. Whilst there is undoubtedly more business transacted at the collieries, there is little, if any, alteration in the price of gas coals. It is not likely to occur. Steam and house coals are moderate in price. There is a little more inquiry for manufacturing coals for shipment, as is usual at this time of the year.

The demand for coke is maintained. The price of a medium quality of this description of fuel is from 11s. to 12s. per ton delivered at the iron-works on the Tyne. Both in coals and coke there are, of course, favoured collieries, which have special and a command in the market; but in relation to the general trade, comprehending all classes of coals, prices are not strong. Under circumstances such as these, it is found impossible for any one single branch of the trade to limit supply and force prices up. It is very probable, therefore, that rates in the gas coal trade will remain pretty much as they have been during the year.

The iron trade of the North of England is affected by fluctuations at the present time. There is a falling-off of demand in the finished iron trade, but it is hoped a better business will be done in September. Iron-

founders are badly off for work as a rule. Prospects are only moderate. The shipments of second-class fire-bricks have fallen away, and the lesser manufacturers, who have been unable to stand lately, are somewhat keen after business, and have been selling rather low; but the first-class establishments, which have had contracts running over the shipping year, are doing very well, as their production is pretty well anticipated for export.

The chemical trade of the North of England, notwithstanding the fact that stocks are generally low at the factories, is very dull. There is a singular lack of orders from the Continent for the season. This circumstance is explained through operators, who bought up chemicals in the early part of the year, having forced their purchases into the market, sold cheaply, and overstocked the trade abroad. Lead and other metals are not materially changed in value; but recent advances in price on this side, have attracted a larger supply of Spanish and German lead into the market.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The iron trade of Yorkshire continues in a somewhat depressed state, particularly in light castings suitable for colliery and building work. In the case of the former there is a demand for iron castings such as gas and water-pipes, and similar apparatus, being in fair request. The make of pig iron has of late shown no falling off, but the output is larger than the demand. Engineering firms are only badly off for orders; but makers of Bessemer steel rails, tyres, &c., are kept fairly going on account of home and foreign orders.

As is usual at this season of the year there is a fair demand for steam coal, chiefly for exportation to the Baltic and other ports. The tonnage to Hull and Goole from the West Yorkshire pits is fairly sustained, whilst some collieries are sending largely to Hull. A very good tonnage is also being forwarded to Grimsby, some of the merchants at that port being partners in South Yorkshire collieries. A good deal of what is sent is supplied per contract at low rates, and where sales are negotiated by private arrangement coal owners are unable to get much higher rates. Hard coal for smelting purposes is not in such good request as was the case a short time ago.

A fair tonnage of gas coal is being sent from several of the collieries in South Yorkshire to the Midland counties, but, as might be expected, the consumption is curtailed by the quiet state of trade. More of the Silkestone coal is likely to be used for gas-making purposes than has been the case for some time, owing to the low figure at which it can be obtained.

The coke trade is much quieter than it was, and prices are consequently easier. The demand for North Lancashire has decreased with the blowing out of some of the best furnaces.

At several large collieries the men have been asked to submit to reductions in wages amounting to about 5 per cent., whilst at others 700 men and boys under notice, the owners declaring their intention of closing the pits until a more profitable season comes round. It is, however, hoped that some terms may be come to which will enable them to continue working.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

A slight increase has been apparent in the demand for coals of several qualities during the past week; chiefly, however, in respect to household sorts, for which there has been noticed a stronger market than has been experienced for several months at least. The demand for gas coal is fairly maintained, and with the advent of the autumn months an increased output is looked for. The bulk of the inquiries in the markets are reported to be of an improved class, and masters are looking forward to the next few weeks as likely to be productive of a change for the better. The call for rough slack, and fuel for smelting purposes, continues to be one of the most active features of the trade.

The failure of the recent memorial from the Tipton district, asking for exemption from the operation of the Mines Clauses Act, was announced a few days ago. The result, which, owing to the memorial not having been signed by the necessary majority, as required by the Act to make it valid, is looked upon with a great degree of satisfaction by a large number of the colliery proprietors and ironmasters of this district, and who, had it been successful, would thereby have been greatly affected.

The pig-iron trade is reported to be steadily improving, and the markets are becoming more active. The production of pig iron in the blast has been noted during the past two or three weeks, yet a brisk run on those in operation continues. At last week's markets a fair trade was done, and some good contracts changed hands. In the finished iron department inquiries for bars at 45 per ton are numerous, though the unmarked brands have perhaps the greatest call. The majority of the transactions were for qualities averaging from 46 10s. to 46 15s. per ton. Galvanized sheets, strip iron, hoops, and common sheets were firm at last week's quotations, and a steady trade was done, the call perhaps being for galvanized sheets, which are in good request for the foreign market. The export trade is less brisk, and but few orders have arrived during the past week or nine days. Coke is a little dearer.

THE SALFORD CORPORATION AND THE PRICE OF GAS IN THE OUT-DISTRICTS.—At the last meeting of the Barton Rural Sanitary Authority, the Clerk read a letter from the Town Clerk of Salford, stating that the Gas Company were prepared to reconsider the offer of a reduction of 3d. per 1000 cubic feet in the price of gas supplied to consumers within 5 miles of the boundaries of the borough, such reduction to date from the 1st of July.

THE FORTHCOMING EXHIBITION OF GAS APPARATUS AT EXETER.—We understand that it is the intention of the Exeter Gaslight and Coke Company to offer four silver medals to the exhibitors of the Sanitary Institute to be held in Exeter from Sept. 21 to Oct. 9 inclusive. The medals will be for the following:—One for the best gas stove or apparatus for cooking purposes for families, including a sufficient supply of hot water. One for the best gas stove for an artisan's family of from four to eight persons. One for the best and most economical open gas fire. And one for the best heating arrangement for general domestic purposes, including the best method of heating baths.

PRESENTATION OF A TESTIMONIAL TO MR. T. ANDERSON, OF BATH.—On Monday evening last week Mr. T. Anderson, who for 18 years has been Manager of the Bath Gas-Works, was presented by the foremen and senior workmen of the Bath Gas-Works, and the members of the Sanitary Institute, with a silver plate bearing the inscription:—"Presented by the workmen of the Bath Gas-Works to the late Manager, Mr. T. Anderson, as a token of their respect." The presentation was made by Mr. Head, one of the foremen, and senior workman. Mr. Anderson returned thanks in a few appropriate words, and observed that, after 18 years he had had the charge of the works he had endeavoured to do his duty to the Company. He thanked the men for their most kindly present. Speaking of the presentation, one of the local papers says: "In thus closing his connection

with the works, it is but fair to say of Mr. Anderson that he has performed an arduous and difficult task with firmness and good judgment. People are not long in grumbling if their gas be deficient, but throughout his long *résumé* Mr. Anderson has achieved the success his energy and sound practical knowledge entitled him to."

EXTENSION OF THE NEW YORK WATER-WORKS SYSTEM.—According to the *Scientific American*, the work soon to be undertaken for the enlargement of the system of water supply for New York City includes the construction of a 15-foot dam at the outlet of the Little Rye pond, connecting both Big and Little Rye ponds, and forming a lake of 380 acres in extent, capable of storing 1000 million gallons. It is also proposed to build a dam on the Bronx, near Kensico, 45 feet high, making a reservoir of 250 acres, having a capacity of 1620 million gallons. A dam will be built across the Byram river 15 feet high, creating a lake with a capacity of 180 million gallons. The Byram and the Bronx Rivers it is proposed to unite at this point. From the Kensico dam the water will be conducted through a 4-foot iron pipe along the valley of the Bronx to a reservoir near William's Bridge in the upper part of the Twenty-fourth Ward, the elevation of which is 180 feet above tide-water and 55 feet above the Croton Aqueduct, and the capacity 100 million gallons. The length of this conduit is 15 miles. The Kensico reservoir will give the city of New York from 18 to 20 million gallons more water daily. It is estimated that the work will be finished in about two years, and cost about 2,700,000 dols. By tapping the Bronx at Kensico there will be obtained not only pure water, but a remarkably good head. The country drained—over 13 square miles—is similar in geological character to the Croton Valley.

THE COSTS INCURRED IN OBTAINING THE BIRMINGHAM GAS (NORTHFIELD AND YARDLEY) ACT, 1879.—On Wednesday, the 18th inst., Mr. Harrison, one of the Inspectors of the Local Government Board, held an inquiry at Birmingham relative to the apportionment, between the parishes of Northfield and Yardley, of the costs incurred in obtaining the above-named Act last year, by which it was provided, it may be remembered, that the Northfield and Yardley districts should be supplied with gas by the Birmingham Corporation at a lower price by 1s. only per 1000 feet than the Corporation Act provided for the borough. After some conversation the Inspector expressed his opinion that the apportionment of the expenses should be in accordance with the proportion of advantage that would be obtained by the respective parishes from the passing of the Act, and this was to be ascertained by the amount of gas consumed in each

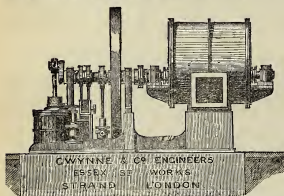
district. The figures submitted to him showed that in 1877 the amount of gas consumed in Yardley parish was 12,910,400 feet, in Northfield district 8,709,900 feet; in 1878, Yardley 15,688,700 feet, Northfield 10,389,400 feet; and in 1879, Yardley 17,483,900 feet, Northfield 11,025,100 feet. This gave as the advantage derived from the Act £872 13s. to Yardley, and £550 5s. to Northfield, or a total of £1423 in one year; so that in 1 title more than two years the two parishes will derive as much benefit as will pay their expenses. Both the Clerks to the Local Authorities assent d to the expenses being apportioned on the basis suggested by the Inspector, who said he would report to the Local Government Board.

APPLICATIONS FOR LETTERS PATENT.

- 3303.—SAMBIDGE, H. W., Birmingham, "Improvements in shades for gas and other lamps, and in the galleries for supporting the same." Aug. 13, 1880.
 3307.—MALLOCK, H. R. A., Bramford Speke, Devon, "A new or improved apparatus for indicating the level of water or other liquid." Aug. 14, 1880.
 3340.—WISCHN, G., Prague, Austria, "Improvements in and appertaining to the distillation of valuable products, more especially antiseptics, from coal tar or coal tar pitch." Aug. 17, 1880.
 3364.—AUBE, P., Paris, "Improved processes for manufacturing steel and lighting gas." Aug. 19, 1880.
 3374.—SIEMENS, C. W., Westminster, "Improvements in gas-producers and furnaces operating in connection therewith." Aug. 19, 1880.
 3382.—WILLOUGHBY, J., Plymouth, Devon, "Improvements in the construction of ball and other valves or cocks for regulating and controlling the supply of water and other liquids." Aug. 20, 1880.
 3406.—SWEET, A., St. Pancras, London, "Improvements in valves known as of the screw-down kind." Aug. 25, 1880.
 3428.—DAY, J. J., Kentish Town, London, "Improvements in water-closet and other valves, and apparatus for cleansing, controlling, regulating, supplying, and withdrawing of water and other liquids, and preventing waste and overflow." Aug. 24, 1880.
 3436.—LAKE, W. R., Southampton Buildings, London, "Improvements in fluid-meters." A communication. (Complete specification.) Aug. 24, 1880.
 3461.—COGLEVINA, D., Vienna, "A centigrade photometer." Aug. 26, 1880.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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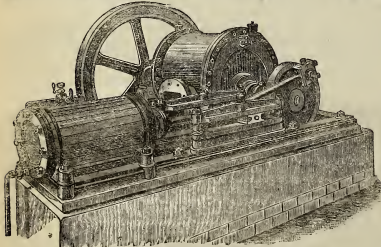
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[SEE ALSO ADVERTISEMENT, PAGE 338.]

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TO CORRESPONDENTS.

J. P.—The procedure and expenses would be settled by the Auctioneer in the ordinary way. Legal assistance should scarcely be necessary.

J. T. P.—In reference to the answer given to this correspondent last week we may state that, in Saturday's "Commissioners of Patents Journal," notice was given of the sealing of a patent, in the name of Carl Pieper (No. 1220, March 22, 1880), for Generator Furnaces, being a communication from Herr Klönne, of Dortmund.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 7, 1880.

Circular to Gas Companies.

THE tenders for the issue of £50,000 of The Gaslight and Coke Company's ordinary "A" consolidated stock, of which mention was recently made in the JOURNAL, were received on the 26th ult., and the applications were found to be for more than double the amount of stock offered for sale. The reserve price was fixed at £184 per £100 of stock, and the new issue was to receive dividends dating from the 1st of October next. The prices actually realized were very satisfactory to the Company. Applications offering over £185 received allotments in full, and 78 per cent. of the amount applied for was allotted at £185; offers at less than this price being declined. As we anticipated, this result manifests the continued confidence reposed by the public in gas property, in spite of unceasing efforts in some quarters to disturb their equanimity. The amount just allotted is not large, in comparison with the total capital of the Company; but, had it been necessary to call up very much more, we are well assured that the premiums realized would not have been materially

lessened. We understand that the average price was rather over 185½ per cent.

The Directors of that flourishing concern, the Crystal Palace District Gas Company, which will soon claim to be considered a Metropolitan Company, have issued their report and statement of accounts for the half year ending the 30th of June last, preparatory to the ordinary general meeting of Shareholders on the 16th inst. The progress of the Company's business is again remarkable. The profits realized during last half year will permit payment of full dividends on all of the Company's shares and stock. This will absorb £11,071 14s. 2d., and the sum of £1755 9s. 8d. will be carried forward to the profit and loss account of the current six months. The price of gas has been reduced, while its quality is maintained; and, as their favoured district continues to grow more populous, the extension of the Company's business by leaps and bounds must be considered as the normal accompaniment of their continued existence.

The Town Council of Bolton have decided to agree to the recommendation of their Gas Committee to reduce the price of gas in the borough, and also to appropriate £10,000 from the accumulated gas profits in aid of the borough fund. The question of devoting a certain amount of the last year's profits to a reserve-fund, and another portion to a depreciation fund, still remains for settlement by a Joint Sub-Committee, composed of members of the Gas and Finance Committees, who will determine the principle upon which the balance-sheets of the gas department shall henceforth be framed. The difficulty under which the Bolton Corporation now labour lies in a nutshell. They have been charging too much for their gas, and they have disagreed over the division of their excessive profits. In deciding to reduce the price, they have taken the surest way to avoid a recurrence of a trouble that ought never to have arisen. Hitherto the gas consumers have been the last parties considered in the management of the gas undertaking, instead of being the first—or the first after capital. The inquiry of the principle on which the Corporation have acted in this matter is conspicuously shown by a letter written to a local paper by a large consumer, who, merely because his business happens to require plenty of light, has been made to pay (indirectly) rates amounting to a shilling in the pound, while his next-door neighbour, whose actual rating was nominally higher, only paid about three halfpence in the pound in the same way. This is the kind of thing that makes large consumers consider the advisability of erecting private gas-works, and in too many cases to find it advantageous to do so. We shall probably return to this Bolton case when the Sub-Committee's report on the system of accounts is made public, for it will be interesting to note how the £14,000 which is still in abeyance is to be dealt with.

The action of the Gas Committee of Leicester in letting gas stoves on hire on very easy terms was fully considered at a special meeting of the Town Council held on the 31st ult., when the report of the Committee defending their procedure, in reply to a memorial originating with the gasfitters and ironmongers of the town, was adopted by a majority of two only. The Committee do not sell any stoves, but they have lent 220 on hire within the past few months, confining themselves to three patterns, on which they charge an annual rental of about 10 per cent. on their cost, and they have made certain arrangements for their renewal by the makers after seven years, the net result of the arrangement showing a slight balance at the end of that time in favour of the Committee, after interest on capital has been provided for. But when it is considered that the calculated balance is only £4 4s. 7d., and that this result is based on the assumption that all the 320 stoves will be in use and returning rent during the whole of the time, and as no allowance is made for repairs or expenses of any kind, it must be conceded that the margin of profit is not sufficient. We do not regard the complaint of the aggrieved tradesmen as of any moment, for, as the Mayor remarked, it is impossible to push business without injury to some one's interests, the coal merchants having as much right to complain of the use of gas for cooking, as the gasfitters of a branch of their business being interfered with. But on general principles it appears more correct to charge sufficient rent for appliances of this kind to cover all possible loss, or to let them out on the principle of hire and purchase within a definite time. By the latter expedient the lessors are freed from the liability to renew at stated periods, and the lessee is likely to be more careful of property which is practically his own than if he had no interest in it. While as to the plea that low rates of hire lead to extended consumption of gas, it may be urged in reply that

if this is desired it can be best effected by selling the gas at the lowest possible price.

The Town Council of Hanley, whose feud with the British Gaslight Company seems to be the serious occupation of their lives, are much troubled with discontented and inquisitive members within their own body as well as with carping critics outside. Their latest specific annoyance has arisen in consequence of one of their number, whose confidence in his fellows is the smallest, having "got wind" of certain unofficial negotiations that have been going on between some members of the General Purposes Committee of the Council, and Mr. Linging, Secretary of the Company, on the subject of the possible basis of any proposal on the part of the Corporation to purchase the Company's undertaking in the Potteries. The *pour-parler*, as diplomatists would term it, was perfectly unofficial, and of a non-committal character on both sides; but it was magnified by the mystery which appeared to surround it, until to the distempered imagination of the malcontent member referred to, it appeared to indicate a reckless intention on the part of the Committee to plunge the town into embarrassing engagements without letting the ratepayers know what was being done. He, therefore, seized the opportunity afforded by the quarterly meeting of the Council last week to ventilate the subject. There was, of course, no secret to be disclosed beyond that of the very harmless confabulations already mentioned, which resulted in nothing, as the Company have decided not to sell their property in Hanley; but the Committee were very indignant at being called upon to justify their action, in reply to imputations on their loyalty to their constituents. Generally, it may be said that by assuming the character of an ever-watchful guardian of the ratepayers' interests, a busy member of a representative body may obtain a cheap kind of popularity which to some men serves for fame; and, in pursuit of this object, such men will badger their colleagues, obstruct business, and render themselves highly obnoxious to the really valuable members of the body to which they belong, in the delusion that they alone are the guardians of the public, and without their unceasing vigilance fearful transactions would always be going on. However useful busy men of this class may be in some respects, the idea which possesses most charm for them, and is the incentive to their greatest activity—the danger of Local Authorities committing their constituents to irrevocable acts by secret plots—would be too absurd for serious notice were it not that its existence is everywhere apparent, and frequently leads to unedifying and sometimes mischievous quarrels among those whose rivalry, however keen, should never lead them to refuse credit to others for the good intentions which they themselves are conscious of possessing.

On Monday, the 30th ult., the Shareholders of the Lancaster Gas Company met for the last time to formally wind up the affairs of the Company, and hand over the undertaking to the Corporation. The works have practically belonged to the town since July last year; but, on the present occasion, the ornamental part of the transfer—its outward manifestation to the multitude—was celebrated with fitting rites. The last act of business performed by the moribund Shareholders was the disposal of an odd sum of over £2500 from the reserve-fund, which they divided in a liberal manner, giving Mr. Fleming, their Engineer, £2000; to the Chairman, £500; and after allotting £1 per share to the Proprietors, the remainder was divided among the Directors. The Corporation have secured a good property, and the Shareholders who obtain £240 guaranteed four per cent. stock for every £100 of shares will probably rest and be thankful for such a placid termination to their corporate existence. The Company was formed in 1825, and on the 24th of February, 1827, the town was first lighted with gas. The Company supplied gas and oil, whichever their customers preferred, until 1856, and just before 1860 their last oil lamp disappeared. The Company has always been a paying concern. For the first thirty years the dividend was five per cent; then seven per cent. was paid for eleven years; and, from 1868 to 1880, ten per cent. As we have recently referred to the results of the first year's working of the undertaking under the management of the Corporation, we need only now add to the record of past success the hope that the present managers of the property will maintain the fair promise with which they enter on their work.

It cannot be said that perfect concord reigned at the half-yearly meeting of the Eastbourne Gas Company, held on the 23rd ult. The financial position of the Company is satisfactory. They have obtained their new Act of Parliament, giving them power to raise additional capital and placing

them under the operation of the sliding scale; and they are able to notify a reduction in the price of gas, from the 1st of October next, from 4s. 7d. to 4s. 4d. per thousand feet, this being the initial price fixed by their new Act. Yet a large section of the Proprietors were not satisfied, and a motion was made to add a fresh name to the list of Directors; but, owing to some informality in the manner of the proposal, it failed of acceptance, and the retiring Directors were reinstated. This misunderstanding did not tend to smooth the way for the subsequent proceedings, and something very like a squabble over the Directors' remuneration, and the character of the gas supply, followed. At the extraordinary meeting afterwards held for the consideration of the recommendation of the Directors that the capital of the Company should be increased by the issue of £10,000 worth of new shares, some difference of opinion was also found to prevail as to the manner in which the shares should be issued. The Directors proposed to put them up for public tender, and afterwards to dispose by auction of any portion not allotted; but a directly contrary course was advocated by some of the Shareholders present, and on the question being put to the meeting the proposition of the Directors was carried only by the Chairman's casting vote, the division being equal. A long and needlessly stormy meeting thus terminated. We say admittedly that the meeting was unnecessarily agitated, for it does not appear that there was anything of sufficient importance as a subject of controversy, in the business to be transacted, to divide the Proprietors against their Board of Directors, to whom great credit must be given for wisely administering the affairs of the Company.

The Wolverhampton Gas Company have signalized the commencement of the current half year by the occupation of their new offices, which are very completely designed for the transaction of the Company's business, and form an ornament to the town. The operations of the past six months have been as successful as the average of corresponding periods in the past; although, from the extraordinary expenses which have been incurred, the balance to be carried forward is somewhat small. The reserve-fund has, however, not been touched. Trade in Wolverhampton was bad during the past year, but it is to be hoped that by this time next year the Chairman of the Board of Directors will be able to report an improvement in this respect.

The Shareholders of the Maidstone Gas Company have just held a meeting at which full dividends were declared on the Company's stock. The principal topics treated of in the Directors' report were the nature and provisions of the new Act which the Company have this year obtained. The Act makes a considerable change in the *status* of the Company, the old system of maximum dividends having given place to the sliding scale, with an initial price of 3s. 8d. per thousand feet—which we cannot think high for Maidstone—and certain onerous restrictions as to sulphur impurities having been imposed at the instance of the Corporation. There was great argument as to the sulphur clauses when the Bill was before the House of Commons Committee, and we trust the ratepayers of Maidstone will derive full benefit from the regulations as to this matter which their interests were supposed to demand. The report briefly mentions the introduction into the Company's works of Liebig's gas generator furnaces, which are stated to give important results. The Directors express regret at the loss of their late Engineer and Manager, Mr. John West, who has been appointed Chief Engineer to the Gas Department of the Manchester Corporation, and have voted him a gratuity of £500, in recognition of the services he has rendered the Company in the construction of their new works, and in other ways beyond the ordinary duties of his office. The present position of the Company is generally satisfactory, and there is every prospect of their being now able to develop their property in peace.

The Wrexham Gas Company have just had a good year's working, and in addition to paying full dividends on their consolidated stock and share capital—interim dividends on which were paid in March last—the Directors found themselves with sufficient balance in hand to recommend the payment of another four per cent. on the consolidated stock, to help make up the deficiencies of former years, this appropriation completing the back dividends which the Directors have felt called upon to pay. Another year of such prosperity, we are told, will enable the Company to found a reserve-fund. We should have thought it more conducive to the real interests of the Company if this had been done before. The Company have recently reduced the price of their gas, so that their realizing such large profits in the past year is all the more creditable to their management.

On Wednesday last an important Industrial and Art Exhibition, under the management of a Limited Liability Company, was opened at Manchester. The promoters of the enterprise are men who enjoy the confidence, and are likely to receive the support of the Manchester public; while in the department of gas fittings and appliances, the Corporation have so far recognized the value of the exhibition as to offer silver medals for the best kinds of apparatus calculated to extend and popularize the use of gas. The judges in this section, Mr. T. Newbighing and Mr. H. Lyon, may be trusted to arrange on a satisfactory basis the competitive trials which are to be held of cooking stoves and burners; and their awards will, at least, be free from the reproach of emanating from men unpractised in gas matters. The section is as yet too incomplete for detailed description, which we hope to be enabled to give later on.

Water and Sanitary Notes.

A LITTLE light now and then dawns upon the public mind with reference to the terms on which the Metropolis might advantageously purchase the undertakings of the Water Companies. "A Ratepayer," in *The Times* last week, quoted the annual report on the Metropolitan Police Force, as showing that the number of new houses in the metropolitan district last year was 21,589. He reckons this as adding over £58,000 a year to the revenue of the Water Companies, and that without taking into consideration the improved income derived from the changing of old houses into new ones, or from any rise in the rates. The effect that this will have on the purchase price is then adverted to. Following this letter in a day or two came one from "F. B.," observing that "if the late Mr. Edmund James Smith were still among us, he 'would probably derive some pleasure from the letter of 'A Ratepayer.' But the latter is reminded that the annual increase in the number of houses was insisted upon 'over and over again' by Mr. Smith, in his evidence and in his letters, as one reason for giving the price which had been negotiated. 'It has been the fashion,' says 'F. B.,' 'to deride what Mr. Smith said, and to regard Sir R. Cross 'almost with compassion for his child-like simplicity; ' whereas it is notorious that among the late Ministry no one 'stood higher as a man of business than the Home Secretary; and Mr. Smith's ability, as well as high character, 'are now, unfortunately, matters of history.' So it is. Superficial considerations have prevailed, and substantial damage is the result. How much did the Metropolitan Board spend over this question, when they prepared the scheme of the dual supply? How much did the recent inquiry before the Select Committee cost? How much more will have to be spent before the proposed Water Authority gets created, and enters on its career? How much will be lost by delay? or, strictly speaking, how much will be added to the value of the water undertakings by the lapse of time? though certainly there is some outlay on the capital account, which would have been prevented by earlier consolidation. Such are the results of that enlightened 'opinion' which will not stoop to pick up facts.

The Manchester City Council have recently been called upon to deal with a very painful subject in reference to what is known as the Hepton case. Hepton was a clerk who had charge of the cash balances of the water-works account, and dealt with these balances in such a way that he was a short time since put on his trial at the Manchester Assizes for fraud and embezzlement, and received a heavy sentence. In the course of Hepton's trial, statements were made which led to a suspicion that certain irregularities—not necessarily of a fraudulent character—had been committed by Alderman Grave, the Chairman of the Water-Works Committee, and Mr. Berrey, the Superintendent of the Water-Works. The inquiry which followed appeared to prove that Hepton had made advances out of his cash balances to both these parties at different times. Such advances, however, were always repaid; and in the case of Mr. Berrey the balance of account was frequently in his favour, owing to the intermixing of his own private account with that of the Corporation. Unfortunately these irregularities opened the way for actual fraud on the part of Hepton. The issue of this affair thus far has been that Alderman Grave has resigned his post, and the Council have been debating what course they shall pursue with regard to Mr. Berrey. The Water-Works Committee, to whom the subject has been referred, have investigated the matter with the aid of a professional Accountant, and have presented a very long report upon the subject, but without proposing any direct line of action with respect to

Mr. Berrey, beyond saying that his "position and duties, 'as well as his emoluments, require their careful consideration.'" At a meeting of the City Council on Wednesday last, the Mayor moved the adoption of the report; whereupon Alderman King moved, as an amendment, that Alderman Grave and Mr. Berrey had ceased to retain the confidence of the Council. After a long debate the amendment was lost by a majority of 38 votes against 10. Another amendment, that the further consideration of the report, should be deferred until the Committee presented their final recommendations with regard to Mr. Berrey, was negatived by 31 votes against 14; and the motion for the adoption of the report was then carried. It is acknowledged on all hands that Mr. Berrey has rendered long and valuable services to the Corporation; while in respect to Alderman Grave, the energy and ability with which he has for many years promoted the interests of the city are undeniable. So far as the question of confidence is concerned, the *Manchester Guardian* shows that there is another aspect to the case, besides that which affects the two individuals now under review. Thus our contemporary says: "Much as we approve of the 'frankness which the Water-Works Committee have displayed in dealing with the case before them, it will take the 'introduction of a new system, and the manifestation of a 'new spirit, to restore entire public confidence in the conduct 'of the local government.' A state of things has been revealed 'which ought never to have been allowed to exist."

"The better municipal government of the Metropolis" is a matter which Her Majesty's Ministers will not pledge themselves to deal with in the next session of Parliament, though they are "fully alive" to the importance of the subject. "So 'many other questions' have to be seen to first that this one will most likely have to stand over. There are some difficult questions that must be dealt with, and there are others which can be 'let alone'—Municipal Reform in the Metropolis is of the latter order. Possibly there are certain gentlemen, less arduously occupied than her Majesty's responsible advisers, who will undertake to deal with the matter, and will produce a little Bill for the purpose; but their success is extremely doubtful. If a great panic could be got up, so as for people to be possessed with the idea that a huge epidemic or other disaster would accrue if London were not municipally reformed, we might then expect to see a re-adjustment of the local institutions of the Metropolis. But people manage to live, and to enjoy themselves tolerably well, under the present heterogeneous system, and it is not easy to provoke any great amount of enthusiasm on the subject. In fact, the enthusiasm is rather the other way, and affects those parties who are likely to be disturbed by the re-adjustment.

In a letter to the *Glasgow Herald*, Mr. G. W. Muir recently discussed the sewage question, and advocated a system of "local deodorization and filtration of house drainage before 'it enters the common sewer.' He objects to 'the system 'now in vogue, of conveying sewage and rainfall together in 'common sewers to the nearest brook or river into which it 'can be emptied.' This 'vile system,' he says, was first made compulsory by the Board of Health when Mr. Edwin Chadwick was the ruling power in that department. Mr. Muir asserts that there is an abundance of contrivances by which drainage can be deodorized and clarified. As for the cost, 'the more money we spend the better, provided we get 'value for it.' Mr. Muir ventures to hope for a golden future 'when we shall be as proud of our drainage as we now 'are of our pictures or plate; and when the host will invite 'his visitors to look at his filter and perhaps taste the sparkling effluent.' Something less than this would probably satisfy the generosity of people.

GAS FROM TURF.—A trial of gas from Bahia turf, says the *South American Journal*, was recently made in the building of the Congresso Gymnasio Portugez, at Rio Janeiro, in presence of his Majesty the Emperor. The gas was made in an apparatus invented by Senhor Joaquim Alves de Souza, who claims to have overcome the practical disadvantages experienced in the trials made in the gas-works, and to be able to produce a standard light for 40 per cent, under the cost of that obtained from gas coal in Brazil.

A NATURAL GAS WELL NEAR BOSTON, U.S.A.—A notable discovery, according to the *Scientific American*, is reported from Ocean Spray, a new summer resort near Boston, Mass. While a driven well was being sunk on July 22, a vein of natural gas, which burned with a clear, brilliant light, was struck at the depth of 122 feet. Being so near a dwelling-house, as to endanger its safety, the blow was smothered and the well abandoned. The owner of the adjoining lot thinking the gas worth boring for, had another well driven; and gas was struck on July 30, and since then the flow has been abundant and strong. A correspondent of our contemporary writes that the pressure of the gas was measured on Aug. 5 by the State Gas Inspector, and found to be that of 3½ inches of water. Photometric tests made by the Superintendent of the East Boston Gas-Works showed the gas to be of 14-candle power, giving a pure and brilliant light with various styles of burners. An attempt will be made to utilize the gas for illumination, cooking, and heating.

THE ROYAL COMMISSION ON THE SANITARY CONDITION OF DUBLIN.

ALMOST exactly a year ago, a Royal Commission was issued, directing Mr. Robert Rawlinson, C.B., and Dr. Francis Xavier F. MacCabe to inquire into the sewerage and drainage of the City of Dublin, and the state of the River Liffey as connected with that city. Mr. W. Jerrold Dixon, barrister-at-law, was appointed Secretary to the Commission, but that gentleman having subsequently died, Mr. Robert O'Brien Furlong, M.A., barrister-at-law, was appointed in his room. The report of the Royal Commissioners was not long since issued, bearing date June 19 in the present year, and is accompanied by the evidence, as well as several maps. The greatest facilities were offered by the local authorities for the conduct of the inquiry, and the assistance thus given is cordially acknowledged in the report. The inquiry is limited to the municipal boundaries, and therefore takes in a population of less than a quarter of a million; whereas Dublin, as popularly understood, possesses a population of more than 300,000. The fact has to be particularly noted that the important townships of Rathmines and Pembroke, formerly included in schemes propounded for the main drainage of Dublin, are now carrying out drainage works on their own account, under an Act passed in 1877.

In the introductory part of the report, the Commissioners speak of Dublin as a city which, by proper sanitary works and efficient surface cleansing, may be made as clean and healthful as "any city in Europe." Concerning the River Liffey, it is said that, though it "may not be purified to its 'virgin state, as before human inhabitants dwelt upon its 'margin, it may be so improved as effectively to render it 'clean, inodorous, and wholesome.'" The Commissioners then proceed, in that which constitutes the second part of their report, to discuss the present sewerage and drainage of the city. Much has been done to improve the main sewers of Dublin since 1851, but the Royal Commissioners consider that these cannot be in the almost perfect condition claimed for them by the City Engineer. The main sewers, as they now exist, are the result of a patchwork system, creditable enough under the circumstances, but still defective in its results. "The sewers of Dublin," says the report, "at present form a network of continuous flue-communication, so 'that any gases generated in the lower portions, and along 'the margin of the river, can flow along the sewers and 'drains uninterruptedly to the higher levels, rendering the 'higher portions and the suburbs, which ought to be the 'healthiest districts, exceptionally unhealthy.'" One great defect in the present sewers has reference to ventilation. The Commissioners calculate that 2400 main sewer ventilators ought to be in operation, whereas there are only 400. The fewness of the ventilators renders the escape of gas from those that exist extremely offensive and even dangerous. In addition to the ventilators, there is need for 500 side entrances, or manholes, and 1000 well-arranged street gullies. The total length of the main sewers is 120 miles.

The house-drainage in Dublin is stated to be extremely defective, and there is reason to believe that the evil extends to all classes of houses. The drains generally consist of loosely-constructed rubble-walled channels, resting upon the soil beneath the basement. These, from their imperfect construction, present numerous points of leakage, through which both gases and liquids escape, to impregnate the air and saturate the earth. Most of these house-drains were originally laid down with a view to the carriage of little more than waste water. Since the introduction of the Varty supply, the use of water-closets has been largely extended, and these drains have become the more dangerous. The abolition of wells and pumps has caused a rise in the level of the water contained in the subsoil, thus bringing into play another source of mischief. "Under such conditions," say the Commissioners, "it is not surprising that the health 'of Dublin should have suffered, and that the mortality from 'diseases classed as constitutional should have remained 'high.'"

In the third part of their report the Commissioners treat of the condition of the River Liffey, and the nature of former main-drainage plans. There was abundant proof that the polluted state of the Liffey had long been a source of nuisance, increasing with the growth and improvement of the city. In 1853, the City Engineer directed attention to the necessity for the construction of intercepting sewers, to prevent the fouling of the river; but this officer recommended the Corporation to form no decision on the subject "until the great works, 'then under discussion, for the interception of the sewage of 'London from entering the Thames, within the metropolitan 'boundary or its vicinity, should be determined on, and the

"works carried out." The advice thus given was adopted, and the question has remained dormant down to the present time. Five plans and estimates for the main drainage of Dublin were brought before the Royal Commissioners, "all 'proposing to expend and waste the intercepted sewage into 'the tidal water.'" Concerning the state of the river, it was evidently doomed to go from bad to worse until something was done to deliver it from the influx of sewage. As to the remedy, the Commissioners accept that which has been proposed, namely, a system of high and low level intercepting sewers on both sides of the river, the sewage to be carried off into deep sea water, at a point where the discharge will be continuous, and where there will be no likelihood of its return. The low-level sewage, according to this plan, would be raised, by pumping, to the level of the outlet sewer. The cost is estimated at £300,000. It is suggested that a sandy area of considerable extent, contiguous to the point of outfall, might be irrigated with a portion of the sewage, so as to grow Italian rye-grass with which to stall-feed milch cows for the supply of Dublin with fresh and wholesome milk.

The fourth part of the report is devoted to "general 'matters relating to the health of the city of Dublin.'" This affords a very painful picture of the state of a great city. Out of a total of 22,830 houses, 9760 are occupied as dwellings let in tenements. Among the latter there are 2300 houses, containing an estimated population of 30,000 persons, which, in the opinion of the executive Sanitary Officer of the Corporation, are in a condition rendering them unfit for human habitation, while some are not worth the outlay requisite for curing their defects. The total tenement population of Dublin is estimated at about 117,000, or nearly one-half the entire number of inhabitants. Among this class "excessive overcrowding is the rule." Down to the time when the Royal Commission was conducting its inquiry, the Dublin Corporation, acting as the Sanitary Authority, had not succeeded in organizing any regular system of domestic scavenging. Hence, "it was not surprising" that the yards, ashpits, and other appliances attached to the tenement houses were described by all witnesses as "extremely filthy," and in a state that was "detrimental to the 'public health.'" Personal visits from the Commissioners fully verified these allegations. The report says: "Amongst 'the several defects of the City of Dublin, the condition of 'the tenement-houses is perhaps the most difficult to be 'dealt with.'" One house sometimes contains as many as seventy-eight tenants. The social and sanitary phenomena connected with this wretched state of things are summed up as comprising overcrowding, filth, foul air, drink, sickness, beggary, and pauperism. There is a public supply of soft, good, and wholesome water, sent into the city in extravagant abundance; yet, practically, the poor have no good water, as it is spoiled by being stored in the rooms. The Royal Commissioners speak of the room-tenements of Dublin as "the great sanitary sore of the city," and give it as their opinion that until these places of residence are improved, "there will be no hope or prospect of bringing the death-rate 'of Dublin to a moderate standard.'"

The Commissioners seek to impress upon the Corporation the importance of adopting the water-carriage system, for the removal of filth, in preference to the pail system. In reference to the water supply, it is recommended that there should be a further amount of filtration, so as to exclude the peaty matter, which is said to cause diarrhoea. Baths and washhouses are greatly needed for the working classes in Dublin, the present provision of the kind being altogether inadequate. The paving of the streets likewise requires attention, and the presence of slaughter-houses. The accumulation of refuse in large heaps within the city boundaries is objected to, and it is hoped that the Corporation will proceed "to abolish these offensive and injurious 'depôts.'" The removal of limekilns from crowded parts of the city is urged, and it is remarked that the law against the contamination of the air by smoke is not duly and fully enforced in Dublin. Finally, it is distinctly recommended that the entire scavenging of the city, both public and domestic, be undertaken and carried out by the Corporation.

The report of the Commission was taken into consideration at a recent meeting of the Dublin Town Council. A remarkably able address was given on the occasion by the Lord Mayor, and a full report on the subject was presented by the Public Health Committee, the document itself having been drawn up by his lordship. The Lord Mayor's address was one of great length, and canvassed all the recommendations of the Royal Commissioners. The great, and apparently the only real difficulty in reference to these recommendations

was that which bore upon the scheme of sewage interception. The plan approved by the Commissioners had not only been prepared by the City Engineer, but had also been endorsed by Sir Joseph Bazalgette. The cost of carrying out this plan will be great, and seemingly it was not so urgent as certain other matters. The state of the Lifey was not considered prejudicial to the public health, whereas certain other things were; and, as the Corporation had no great pecuniary resources, it was seemingly the wisest plan to deal first with the more urgent matters. It was the opinion of the Committee that the Council should do nothing with regard to the main drainage this year, partly because there was no time for full discussion of the subject, and partly because it was desirable first of all to receive the forthcoming report of the Boundary Commissioners. As to the completion of the city sewers, that was already in hand, and £30,000 would be expended for the purpose. The ventilation of the sewers, as set forth by the Royal Commissioners, was acknowledged to be a matter of great importance, though the lack of funds would cause some delay in extending the arrangements to the old sewers. The Committee acknowledged that the Royal Commissioners had given a true description of the state of the house drainage. The picture was as correct as it was lamentable, the people suffering both in health and morals. "There were 24,000 'houses in Dublin,'" said the Lord Mayor, "and probably one 'half of them, at least, were in a very bad sanitary condition.' The mere inspection of them would take a long time, and the re-construction of house drains would involve years of hard work. But the Committee had not been idle in the matter, and they would hereafter endeavor to deal with it more effectually, especially as they now had larger powers. The tenement-houses presented the most difficult problem of all, but the Committee were depopulating the worst of the houses by degrees, and with the operation of the Artizans Dwellings Act would come a greater degree of improvement than had hitherto been practicable.

Proceeding with the other recommendations of the Royal Commissioners, the Lord Mayor said the Committee were all agreed that the scavenging of the entire city should be carried out by the Corporation. The opinion of the Commissioners that the Vartay water required more filtration was not acquiesced in by the Committee. They also felt some hesitation with regard to the laying on of water to the tenement-houses, the destructive habits of the occupiers being a formidable obstacle. The removal of the limekilns, and the stricter enforcement of the law against smoke nuisances, were modes of proceeding which the Committee viewed with some apprehension, as likely to harass the few manufacturers left in Dublin. In respect to the various recommendations of the Royal Commissioners, there was thus a general concurrence on the part of the Committee, the exceptions being those which we have already specified, and the most important that with reference to the proposed system of interception for the purification of the Lifey. The report of the Committee was adopted, except that the recommendation of the Royal Commissioners for a better system of water supply to the tenement-houses was referred back to the Committee for further consideration, the Council being of opinion that the supply might be improved with less difficulty than the Committee had apprehended. So the matter stands for the present, and it is a subject for congratulation that the Dublin Town Council have received the report of the Royal Commission with so good a grace. The postponement of the drainage interception scheme is doubtless a serious drawback, but so much is going to be done in other directions that it is impossible not to feel gratified and hopeful. It is certain, however, if the house drainage is to be improved, that the Lifey will be the worse for it, and we hope the Council will make a very short postponement of the larger question.

REDUCTION IN THE PRICE OF GAS AT CLAYTON.—The Directors of the Clayton, Allerton, and Thornton Gas Company announced a further reduction in the price of the gas supplied by them, namely, from 4s. 2d. to 3s. 4d. per 1000 feet, if the accounts be paid within six weeks from the end of each quarter.

VICTORIA (NEWMARKET) GAS COMPANY.—The annual meeting of this Company was held on Friday, the 27th ult.—Mr. R. Stephenson in the chair. The Directors report and balance-sheet were submitted to the meeting by the Chairman, who proposed that they be adopted, which was carried unanimously. The balance-sheet showed a very satisfactory result, the profits being sufficient to enable the Directors to recommend the payment of a dividend of 10 per cent. upon the ordinary and new shares of the Company, the remainder to go to the reserve-fund and next year's account. The retiring Directors (Messrs. Stephenson, Brier, and White) were unanimously re-elected, and Mr. Ennon was re-appointed Auditor. It was proposed, and carried unanimously, that the Directors have the thanks of the Shareholders for the efficient services rendered to the Company. A vote of thanks to Mr. Thomas Wilkinson, the Secretary and Manager, was also carried unanimously, and that gentleman suitably acknowledged the compliment.

THE GERMAN ASSOCIATION OF GAS AND WATER WORKS ENGINEERS.

The Twentieth Annual Meeting of this Association was held at Heidelberg the same week that the British Association of Gas Managers met in London. Herr Kummel presided, being called to the chair in the absence through illness of Herr Grahn, who was elected President last year. The members of the Association now number 352, and a reform of the organization, in order to adapt it to modern conditions, is in contemplation. The meeting was well attended and very successful.

One of the principal subjects discussed at the meeting was the process of Messrs. Lowe, Strong, and Dwight for making water gas, which is claimed to have surmounted all the practical difficulties hitherto found insuperable in this well-known process.

Herr Hasse, of Dresden, contributed a valuable paper on gas generator furnaces, which we hope soon to lay before our readers. The manner in which the question of gas firing is now regarded in Germany is quite different to that which prevailed but a short time since. These furnaces are fast replacing the old-fashioned simple coke-fire settings, not only in large gas-works, but also in small establishments. According to a statement made at the meeting, there were 370 retort-settings, containing 2469 retorts, working on one or another system of gas heating on Dec. 31 last. In this total is included every size setting containing from 1 to 11 retorts, except settings of 10, which do not appear in the list. The extent to which small works are represented in this return may be appreciated from the fact that 77 settings, or 21 per cent. of the whole, contain less than 6 retorts each.

Herren Salzenbourg and Hasse both dealt with the subject of increasing the illuminating power of gas, the former by naphthalene carburation, and the latter by warming the air supply on the Siemens system of regeneration. Success, to a certain extent, was claimed for both these methods of attaining a universally desired end, but neither is as yet sufficiently developed for general adoption.

The Photometric Committee, appointed to examine into the Methven unit, which possesses many friends in this country, reported unfavourably respecting the proposal to adopt it instead of the candle for photometrical measurements. According to this Committee, the Methven unit is more liable to variation than the candle, so that nothing would be gained by its adoption. Such is the opinion which their experiments have led them to form, in which conclusion they are joined by Dr. Rüdorff.

The use of gas for cooking and heating purposes, to which the President drew attention in his address, was discussed with much interest. This application of gas is as yet but little developed in Germany, especially in comparison with Denmark, where many small towns use half their consumption for these purposes. The Danish cooking utensils are celebrated throughout all Europe, and it would be well if we in England were to study the causes of this peculiar Danish phenomenon. Half of the total consumption of gas supplied to a town being used for heating and cooking, and the remainder for lighting, means an almost uniform delivery of gas through the mains during every hour of the day, which would appear to most gas managers a very curious condition of things.

Under the auspices of the Association, a grand exhibition of gas cookers and heating apparatus will be held at Frankfurt next year, which, it is hoped, will help to draw public attention to the utility of gas for purposes in connection with which it appears to have been so generally neglected in Germany.

RAILWAY RATES FOR THE CARRIAGE OF MINERALS.

Some reference has lately appeared in *The Times* to the hindrance to business caused by the lack of agreement between different railway companies in the matter of through rates for goods. The subject is of some interest for large consumers of coal—among whom gas manufacturers are conspicuous—since it is in this class of minerals that anomalies in carriage rates most frequently occur. Coal agents who are in the habit of sending large quantities of coal from particular districts to certain of the well-known receiving stations are, of course, able to make bargains for rates and other incidental charges, with great ease and certainty as to the amount they have to allow for such expenses in quoting for forward deliveries; but it too often happens that vexatious delays arise in obtaining rates for transport of coal over a new route to a free destination, and when the rates are obtained it is sometimes found that they are made up without much reference to the actual distance to be traversed, or any other consideration which could have been foreseen by the inquirer. In this way coal raised in a certain district may be rendered more inaccessible to consumers at no great distance—but with several unfriendly railway companies intervening—than to a distant market to which the communication is more reasonably ordered.

An instance is given in our contemporary wherein a merchant wished to send mineral from, say, A to C, through B. He had been quoted a rate of 10d. per ton from A to B, and an equal rate from B to C; hence he very reasonably expected that the two rates added, or 1s. 8d., would equal the rate for the whole distance. However, after waiting six months for information on the point, he was told that the rate would be 2s.—an advance of 20 per cent. on the two separate rates, without a shadow of excuse being offered for what must be termed a foolish imposition. A difference of 4d. or 6d. per ton in the cost of minerals of similar character from two places, may be naturally expected to turn the scale when great quantities are in question; and it is not consistent with our pretence of pre-eminence as a commercial community that we should endure these unfair differential charges, or the uncertainty which exposes

a merchant to the risk of losing his market before he can get at the cost of delivering his goods.

The network of inland communication in this country has become complicated, in consequence of the manner of its growth—at first on independent lines and afterwards by junctions and branches without number; and the manner in which the different railway companies work their own and their leased lines, with views solely directed to their own advantage, present or future, have together made the transmission of goods a subject demanding for its thorough comprehension all the attention necessary for the acquisition of a trade. Much is occasionally said of the apprenticeship and capacity for abstruse combinations needed for the mastery of Bradshaw's Guide; and certainly an examination on his power to select rates between a group of towns, in accordance with the information contained in that important publication, would not form a bad test of a young man's fitness for commercial pursuits. But the regulations of the passenger traffic are simplicity itself compared with the eccentricities of railway goods management which, until sweeping changes can be universally adopted, must be conceded as having taken, in our modern days, the character of unathomable mystery possessed in old time by the enterprising managers of Eleusian or Sybilline affairs.

But reform in matters of this kind is long in coming, there being no controlling authority beyond the vague pressure of public opinion by which it can be initiated; and, therefore, as an improved state of things can only ensue from a complete agreement between a number of independent trading corporations, at present existing in mutual rivalry, veiled discord, or open enmity, the prospect of complete relief being afforded to sufferers from the manifest injustice of the present system—if such it may be called—is not very clear; but we would fain believe that some of the worst delays and inconveniences arising from it may be remedied in consequence of the agitation (mild as it has been) which has followed upon their recent public exposure.

Notes.

[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

ANSELL'S PATENT GAS LEAKAGE INDICATOR.

At the meeting of the British Medical Association, which was held at Cambridge in the early part of last month, Mr. Jabez Hogg read a paper and exhibited several scientific instruments of considerable value and interest to the public, for the detection of gas leakages, escapes of sewer gas, &c.; also a fire-damp and choke-damp indicator, the invention of Mr. G. F. Ansell. The paper stated that the principle of the several instruments was founded on the law of diffusion, all gases having a tendency to mix or diffuse—even when they differ in specific gravity and the heavier gas is at the bottom of the vessel and the gases are allowed to remain at rest. They do not combine chemically, and the rate at which they diffuse varies; but the action is somewhat promoted by the interposition of a thin plate of graphite or other porous substance. Experimental research has shown that the velocity of diffusion of gases is inversely proportional to the square roots of their densities; thus 4 volumes of hydrogen will pass through a porous diaphragm in the same time as 1 volume of oxygen, oxygen being 16 times as heavy as hydrogen. Mr. Ansell has worked upon this law, and constructed a small portable apparatus for ascertaining the amount of gas in a mixture of gas and air, in order to determine whether or not it is of an explosive character. It is a small instrument—about the size of a carriage clock—with a 3-inch dial, graduated in every $\frac{1}{2}$ per cent. up to 35 per cent. The dial is further marked "non-explosive" at 5 per cent.; "explosive" at $\frac{1}{2}$ per cent.; "most explosive" at 10 per cent.; at 15 per cent. "gas burns;" while beyond this point a "non-explosive" mixture is indicated by the hand of the instrument. The action is actuated by a modification of an aneroid barometer, the action of which is effected through a small slab of terra-cotta placed at the back of the mechanism. It is proposed that this porous material shall be exposed to the influence of the mixture of gas and air which it is intended to test, and in the course of a second of two the hand on the dial will indicate the percentage of gas contained in the compound. A tap is arranged at the top of the instrument, in order to allow the contained gas to escape, and so allow the dial hand to go back to zero.

LIGHTNING CONDUCTORS AND GAS-MAINS.

In a recent number of the *Deutschen Bauzeitung*, Professor Kirchhoff replies to the City of Berlin Gas Authorities, who have expressed the fear that gas-pipes are liable to injury by lightning, if the pipes are connected to form the earth terminal of lightning-conductors. The Professor states that he has never known of a case of injury to a gas or water pipe arising from connection with a lightning-rod, but there have been many instances of damage to buildings and pipes when the latter have not been connected to the conductor. No earth terminal specially made for a lightning-rod can be so perfect as that offered by an extensive ramification of subterranean pipes, possessing in some cases a surface capable of measurement in square miles. Hence lightning will leave a badly-connected rod to enter the nearest gas or water pipe within the range of its influence, and the consequence is rupture in extent proportionate to the violence of the discharge and the intervening distance over which it has leaped. Hence, all masses of iron in a

building, and all internal gas and water pipes, should always be put in good electrical connection with the lightning-rods with which it may be provided. The violence of any possible discharge is then provided for. Professor Kirchhoff cites two instances, at Düsseldorf and at Steglitz, where lightning is known to have struck rods closely connected to gas and water pipes. In both cases the rods, buildings, and pipes were uninjured.

A CLOCK-DIAL GAS-METER AND REGULATOR.

Mr. J. Foxall, of the Gas-Works, Newport, Mon., has recently patented a meter which is intended to possess certain advantages over meters of the old type. It is essentially a dry meter with circular disc diaphragms of ordinary construction, but the gear is so placed as to allow the diaphragms to open the full width of the case. The valve and its levers are at the top, over the diaphragms; and in the same compartment of the case is a governor to regulate the outlet pressure. The dial occupies rather more than the upper half of the face of the case, and in appearance resembles that of a chronometer with short and long hands and a small seconds dial. The large dial is graduated into tens with ten subdivisions between each of the figures. The index reads in the same way as the time is read by a clock, the small hand indicating tens of thousands and the long hand registering thousands, the subdivisions between the figures giving the hundreds. The seconds dial shows the odd number of cubic feet of gas consumed. The case is intended to be made ornamental so that it could stand displayed in a room or entrance hall, instead of being stowed away like ordinary meters are, in a cupboard, or down in the cellar.

ANOTHER NEW GAS.

An account of a wonderful new gas, made from pure oil of any kind, pure water, and pure air, appeared in the number for Aug. 20 of the *Medium and Daybreak*, a journal which principally circulates among Spiritualists. The name of the inventor of the "New Gas," as it is termed, is not stated, nor is the locality where it may be seen, although it is said to be open to general inspection. A glowing description is given of the purity, brilliancy, and softness of the new light, which, moreover, is said not to vitiate the air of the room where it is burned, and if required the flame may be medicated or perfumed! Gas companies are warned that the hour of their discomfiture is come, unless they immediately proceed to adapt their works for the production of this new luminant, the price of which is estimated at 1s. 6d. per 1000 feet to the general public. It need not be made on a large scale, as consumers will be able to manufacture their own, the necessary apparatus for supplying an ordinary house being so compact as to be capable of being hidden away in a back kitchen. No trouble is anticipated in working it, provided that the raw material can be obtained of the requisite purity. This may cause some little difficulty, for it is something stated that pure air and water are not easily found, to say nothing of pure oil.

TECHNICAL EDUCATION IN THE CITY OF LONDON.

The Director of the City and Guilds of London Institute for the Advancement of Technical Education has issued the syllabus for the winter series of lectures to students and working men, which will be delivered in October, November, and December next, at the temporary class-rooms of the Institute, Cowper Street, Finsbury. There is a laboratory, for practical instruction in chemical manipulation, attached to the class-rooms, for the use of day and evening students. The subjects allotted for treatment in the department of Chemistry, by Professor Armstrong, are the coal tar products, brewing, spirit distilling, and allied industries; while the electric light, electrical instrument making, weighing appliances, and motor machinery will be dealt with by Professor Ayrton, in the division of Applied Science. The fees for the courses are very moderate, and the popularity of these lectures may be inferred from the statement that 192 students, taking out 353 tickets for the different classes, attended during the last spring term.

PRIVATE BILLS AND PROVISIONAL ORDERS FOR THE SESSION OF 1880.

On opposite page is published the completed table showing the proceedings, during the session of 1880, in regard to private Bills relating to gas, water, &c., from which it will be seen that of the Bills for which notice was given last November [see JOURNAL, Vol. xxxiv. pp. 856-7], the great majority—viz., 42—have received the Royal Assent. Of the remainder, there were several instances in which Bills, pursuant to the notices given, were not even deposited. In other instances—such as the Birkenhead Borough Bill, the South Metropolitan and Phoenix Gas Companies Bills, and the Southwark and Vauxhall Water Company's Bill—few, if any, steps were taken beyond the presentation of the petitions for the Bills. Of the Bills that collapsed at the committee-stage, the Hyde Gas, Rathmines and Rathgar Township (Varray Water Supply), and Sea Water Supply to London Bills were thrown out; while the Cork Gas Company's Bill, after being passed by the Commons Committee, was withdrawn by the promoters. The Board of Trade report on their proceedings during the past session, under the provisions of the Gas and Water Works (Facilities Act of 1870, and which will also be found in another column, shows that they accepted to all the applications made to them, and granted 15 Provisional Orders—7 in respect to gas, and 8 to water—which were subsequently confirmed by Parliament without opposition.

It is stated that a gratuity of £1500 is to be paid to the Town Clerk of Liverpool (Mr. Joseph Rayner), on account of his services in connection with the Vyrnwy water scheme.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.

PROCEEDINGS DURING SESSION 1880.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Ackworth, Featherstone, Furston, and Sharlston Gas Bill	Lords	Comms. Bill Feb. 9	June 25 Feb. 10	July 5 March 8	July 15 June 15	July 20 June 24	August 2
Birkenhead Borough Bill	Commons.	Bill with- drawn.					
British Gaslight Company, Limited (Staffordshire Potteries), Bill	Lords	Feb. 10	Feb. 10	Feb. 23 July 5	June 17 July 20	June 22 July 28	August 2
Burton-upon-Trent Corporation Bill	Commons.	Lords Bill.	June 24	July 5	June 4	July 23	August 6
Cardiff Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 11	May 25	June 29
Chester Gas Bill	Commons.	Feb. 9	Feb. 10	Feb. 20	March 8	June 11	June 29
Cork Gas Bill	Lords	Lords Bill.	March 11	May 31	June 11	June 15	June 29
Cork Improvement Bill	Commons.	Comms. Bill Feb. 9	March 12	March 19	June 4	June 8	June 29
Dagenham and District Farmers (Optional) Sewage Utilization Bill	Lords	Bill with- drawn.					
Dartford Gas Bill	Commons.	Feb. 10	Feb. 10	Feb. 24	March 2	March 11	June 29
Dearne Valley Water Bill	Lords	Comms. Bill Feb. 9	June 25	July 5	July 15	July 19	August 2
Denton and Haughton Gas Bill	Commons.	Lords	Feb. 10	Feb. 16	June 15	June 24	August 2
Doncaster Corporation Water Bill	Commons.	Comms. Bill Feb. 9	July 9	July 16	July 23	July 29	August 6
Eastbourne Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 17	June 15	July 8	August 6
Edinburgh and District Water Bill	Commons.	Lords Bill.	July 23	July 23	July 27	July 30	August 2
Exmouth and District Water Bill	Commons.	Feb. 9	Feb. 10	March 15	July 6	July 15	August 2
Gaslight and Coke, Commercial Gas, and South Metropolitan Gaslight and Coke Companies Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 16	May 25	August 2
Great Yarmouth Water Bill	Commons.	Lords Bill.	May 28	June 15	June 22	July 5	August 2
Hinckley Local Board Gas Bill	Lords	Comms. Bill Feb. 9	June 1	June 18	June 22	July 5	August 2
Huddersfield Tramways and Improvement Bill	Commons.	Comms. Bill Feb. 9	June 1	June 18	June 22	July 5	August 2
Hall Lighting Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 17	May 31	June 29
Hyde Gas Bill	Commons.	Lords Bill.	Feb. 10	Feb. 16	March 17	May 31	June 29
King's Lynn Corporation Bill	Commons.	Lords Bill.	May 28	June 15	June 22	July 5	August 2
Lancashire County Justices (Water, &c.) Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	July 9
Lancaster Corporation Bill	Commons.	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	July 9
Lincoln Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	July 9
Liverpool Corporation Water Bill	Commons.	Lords Bill.	May 27	June 8	June 24	June 28	August 2
Liverpool United Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
London Gaslight Company Bill	Commons.	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Maidstone Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Malton Gas Bill	Commons.	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Oldham Improvement Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Phoenix Gaslight and Coke Company Bill	Commons.	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Portmadoc Water Bill	Lords	Bill with- drawn.					
Prescot Gas Bill	Commons.	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Preston Improvement Bill	Lords	Lords Bill.	June 18	June 28	July 6	July 9	August 2
Rathmines and Rathgar Township (Varttry Water Supply) Bill	Commons.	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Rathmines and Rathgar Township Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Reading Gas Bill	Commons.	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Rochester Corporation Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Sea Water Supply to London Bill	Commons.	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Sligo Borough Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
South Metropolitan Gas Company Bill	Commons.	Lords Bill.	June 17	June 28	July 20	July 23	August 2
Southwark and Vauxhall Water Bill	Lords	Bill with- drawn.					
Stafford Borough Bill	Commons.	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Wakefield Corporation Water Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Wandsworth and Putney Gas Bill	Commons.	Lords Bill.	March 18	June 7	June 25	July 9	August 2
Wigan Improvement Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Wrexham Water Bill	Commons.	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2
Yeadon and Guiseley Gas Bill	Lords	Comms. Bill Feb. 9	Feb. 10	Feb. 16	March 12	May 25	August 2

GAS AND WATER WORKS FACILITIES ACT, 1870.

PROCEEDINGS UNDER THE ACT DURING THE SESSION OF 1880.

We have been favoured with a copy of the report, presented to both Houses of Parliament on the 26th ult., by the Board of Trade on their proceedings under the above-named Act during the session of 1880. It states that 15 applications for Provisional Orders were made to the Board—viz., 7 in respect of gas, and 8 in respect of water; and these sought power to raise £380,000 by shares and loans. A fee of £95 was received with each application.

GAS ORDERS.

The following were the Gas Orders applied for:—Chew Magna, Garstang, Halstead, Harrogate, Holywell, Long Eaton, Trowbridge.

The Chew Magna, Halstead, Holywell, Trowbridge, and Long Eaton Orders proposed to maintain and continue existing gas-works, and to supply gas; and the Long Eaton Order sought for power to construct additional works. The Garstang Order proposed to construct and maintain new gas-works, and to supply gas; and the Harrogate Order sought for power to raise additional capital. The Board granted an Order in each case.

The sliding scale of price and dividend was adopted by the promoters of the Halstead, Harrogate, and Long Eaton Orders, the standard price for such purpose being fixed by the Board in the Halstead Order at 6s. per 1000 feet, and in the Harrogate Order at 5s. 6d., subject, in the latter case, to a discount at the rate of 10 per cent. upon any payment made within six weeks after the termination of the quarter in which gas was supplied; in the Long Eaton Order, at 5s. 2d. for gas supplied within, and 6s. 3d. for gas supplied beyond the township of Long Eaton and within the limits of supply. Power was also granted in the Long Eaton Order to levy a fine of 1d. for every lb. on all amounts not paid within one month after demand.

The maximum price in the Chew Magna, Garstang, Holywell, and Trowbridge Orders was fixed at 7s., 7s. 6d., 5s. 6d., and 4s. 6d. per 1000 feet respectively, with a provision in the case of the Chew Magna and Garstang Orders that, after the expiration of two years from the date of the passing of the Act confirming the Orders, the Board may, upon the application of the local authority of any district, or of 20 inhabitant rate-payers within the limits of supply, alter the maximum price.

Objections to nearly every Order were lodged, but they were not such as to necessitate public inquiries, except in respect to the Long Eaton Order. In this case the Board of Trade appointed Major Martin, R.E., to hold a local inquiry at Long Eaton. This officer reported that the existing works required extension to meet the wants of the town of Long Eaton, that the new site was especially well fitted for the new works, that it would be for the benefit of the consumers that the existing Company should be placed under the provisions of the Act, and that the opposition of 30 out of 80 residents within the limits of the new works should not be allowed to prevent the granting of the Order.

The usual clauses with respect to the sale of shares of the additional capital by auction or tender were inserted in all the Orders, with the exception of the Holywell and Trowbridge Orders, which were promoted by the British Electric Light and Power Company, Limited, and by Act of Parliament to construct gas-works at other places, but were not made subject by their Acts to the auction clauses.

The ordinary clauses, which are generally introduced into Gas Acts, are inserted in all the Orders.

No powers relating to the electric light were granted by any of the Orders.

WATER ORDERS.

The following were the Water Orders applied for:—Broadstairs, East Blatchington and Seaford, Gisborough, Harrogate, Luton, Newhaven and Denton, Norwood (Middlesex), Pwllheli.

The East Blatchington and Seaford, and the Newhaven and Denton Orders proposed for authority to construct new water-works, and to supply water; the Pwllheli Order to maintain and continue existing water-works, to construct additional works, and supply water; the Broadstairs, the Gisborough, the Harrogate, the Luton, and the Norwood (Middlesex) Orders sought for power to raise additional capital. The Gisborough and Harrogate Orders also sought for power to construct additional works; and the Norwood (Middlesex) Order to extend their authorized limits of supply. The Board of Trade granted an Order in each case.

In the case of the Norwood (Middlesex) Order, the consent of one of the local authorities having been refused, the Board of Trade appointed Major Martin, R.E., to hold a public inquiry. Upon his report the Board of Trade dispensed with the consent of this Local Authority.

The Bill to confirm the Orders was introduced into the House of Commons on the 24th of May; it passed through both Houses of Parliament without opposition, and received the Royal Assent on the 19th of July.

Miscellaneous News.

ON THE BEST MEANS FOR THE DEVELOPMENT OF LIGHT FROM COAL GAS OF DIFFERENT QUALITIES.

By Dr. WILLIAM WALLACE (Secretary), Professor DITTMAR, and Mr. JOHN PATTINSON, F.C.S., F.I.C.

PART II.—Drawn up by Mr. PATTINSON.

[A Report presented to the Swansea Meeting of the British Association, Aug. 26, 1880.]

The first part of this report, which was presented at the meeting of the British Association in 1878, had reference chiefly to the use of canal gas, such as is supplied in most of the towns of Scotland, and which has an illuminating power equal to 26 candles when burned in a union-jet burner at the rate of 5 cubic feet per hour, and under a pressure of 0.5 inch. It also pointed out the best known means of burning this quality of gas, and gave the results of photometric testings of several kinds of burners under varying conditions of pressure.

It is the object of this second part of the report to give similar information regarding the burning of what is known as common gas, or gas made from the common bituminous coal of the Newcastle and other coal fields, and from this class of coal mixed with a small quantity of canal coal, and having an illuminating power equal to 16 standard sperm-candles when consumed at the rate of 5 cubic feet per hour in Sugg's No. 1 "London" Argand burner—the standard burner adopted in London by the London Gas Referees, and prescribed in nearly all recent Acts of Parliament of gas companies. This quality of gas, or gas varying from 14 to 16 candles illuminating power, is chiefly used in London and in most towns in England and Ireland.

The principal condition to be observed, in order to develop the maxi-

mum amount of light from coal gas, is to supply the flame in a suitable manner with just sufficient amount of air to effect the complete combustion of the gas. If coal gas is lighted as it issues, under a low pressure, from the end of a gas-pipe from which the burner has been removed, it burns with a long, irregular-shaped flame, giving off much smoke, and yielding a dull, yellowish light of very little intensity. The gas has to ascend to a considerable height before it meets with sufficient air to consume it completely, and the upward currents created by the heat waft the languid flame about in all directions, and cause it to give off smoky particles. On the other hand, if the gas is forced under considerable pressure through a very small orifice or very narrow slit, it burns with a thin bluish flame, without visible smoke, and yielding very little light. The small, rapid stream of gas, by virtue of the force with which it issues, becomes mixed at once with such an excessive amount of air that the carbonaceous constituents of the gas, instead of being partially separated and made incandescent, are converted at once into carbonic acid in a flame having little or no luminosity, just as when gas is burned in a Bunsen burner. These illustrate two cases in which air is supplied to the flame in an unsuitable manner, one in which air is supplied too slowly, and the other in which it is too rapidly mixed with the gas. As in flat-flame burners the air supply is chiefly regulated by means of the pressure under which the gas is allowed to issue, it is necessary to avoid these two extremes in order to develop the light-giving properties of the gas. The dimensions of the orifice through which the gas issues from such burners, and the velocity with which it issues, should be so adapted to each other that the gas in burning is brought into contact with air in such a manner that the heat developed from a portion of the burning gas heats the remainder to a high state of incandescence before it is ultimately entirely oxidized. The quality of a flat-flame burner depends almost entirely on the extent to which this condition is fulfilled. In Argand burners, or at any rate in those of the best construction, the due supply of air is admitted to the interior and exterior of the cylinder of flame, and regulated by means of the chimney and cone, the gas being allowed to issue from the burner under little or no pressure. A more complete control is thus obtained over the air supply than is possible in the case of flat-flame burners, and it is probably on this account that more light can be developed from common gas when burned in good Argand burners than when burned in ordinary quantities in flat-flame burners.

The effect upon the air supply of the pressure under which gas is caused to issue, and consequently upon the amount of light emitted, is shown in the following results of experiments made with union-jet and bat's-wing burners having orifices of various dimensions and unprovided with any means of checking pressure. The gas was caused to pass through them under different pressures applied by means of a weighted gas-holder. The gas used was equal to 16 candles when tested with the standard burner—Sugg's No. 1 "London" Argand.

Union-Jet Burners.

Pressure of Gas in Inches.	Cubic Feet of Gas used per Hour.	Illuminating Power in Standard Candles.	Illuminating Power per Five Cubic Feet of Gas per Hour.
No. 1, with holes 0.021 inch diameter.			
0.5	1.6	1.0	3.1
0.6	2.2	1.2	2.4
1.5	3.2	1.2	1.9

No. 3, with holes 0.032 inch diameter.			
0.3	1.3	1.8	7.0
0.5	2.3	3.4	6.8
0.6	3.3	4.4	5.8
1.5	5.1	5.0	4.9

No. 6, with holes 0.043 inch diameter.			
0.2	1.2	1.8	7.5
0.3	2.0	3.7	9.2
0.5	3.8	7.3	9.6
0.7	4.7	8.8	9.2
1.0	6.0	10.2	8.5
1.3	8.1	12.0	7.4

Bat's-wing Burners.

Pressure of Gas in Inches.	Cubic Feet of Gas used per Hour.	Illuminating Power in Standard Candles.	Illuminating Power per Five Cubic Feet of Gas per Hour.
No. 2 burner, with slit 0.008 inch wide.			
0.5	0.8	1.0	6.3
0.5	2.0	4.0	10.0
0.7	2.8	5.7	10.2
0.8	3.7	7.6	10.5
1.2	4.4	7.6	8.6
1.5	5.4	9.0	8.3

No. 4 burner, with slit 0.012 inch wide.			
0.3	1.3	2.7	10.4
0.5	3.2	7.6	11.9
0.6	4.3	10.1	11.7
1.0	5.6	12.6	11.3
1.2	6.4	14.0	10.9
1.5	7.7	16.4	10.6
2.0	9.0	17.3	9.7

No. 6 burner, with slit 0.014 inch wide.			
0.3	1.4	2.6	9.3
0.5	3.7	9.6	12.6
0.7	4.7	12.6	13.5
1.0	6.1	15.7	12.9
1.2	7.0	17.7	12.7
1.5	8.5	19.5	11.5
2.0	9.0	19.5	11.5

Another bat's-wing, with slit 0.006 inch wide.			
0.4	3.2	9.1	14.2
0.6	3.7	17.2	13.1
0.8	7.1	23.6	13.9
1.0	9.3	27.9	16.3
1.2	9.3	30.8	16.6
1.5	10.2	32.6	15.7
1.8	11.1	33.9	14.9
2.0	11.8	34.0	14.4
Flares.			

No. 4 burner, with slit 0.012 inch wide.			
0.3	1.3	2.7	10.4
0.5	3.2	7.6	11.9
0.6	4.3	10.1	11.7
1.0	5.6	12.6	11.3
1.2	6.4	14.0	10.9
1.5	7.7	16.4	10.6
2.0	9.0	17.3	9.7

No. 6 burner, with slit 0.014 inch wide.			
0.3	1.4	2.6	9.3
0.5	3.7	9.6	12.6
0.7	4.7	12.6	13.5
1.0	6.1	15.7	12.9
1.2	7.0	17.7	12.7
1.5	8.5	19.5	11.5
2.0	9.0	19.5	11.5

Another bat's-wing, with slit 0.006 inch wide.			
0.4	3.2	9.1	14.2
0.6	3.7	17.2	13.1
0.8	7.1	23.6	13.9
1.0	9.3	27.9	16.3
1.2	9.3	30.8	16.6
1.5	10.2	32.6	15.7
1.8	11.1	33.9	14.9
2.0	11.8	34.0	14.4
Flares.			

No. 4 burner, with slit 0.012 inch wide.			
0.3	1.3	2.7	10.4
0.5	3.2	7.6	11.9
0.6	4.3	10.1	11.7
1.0	5.6	12.6	11.3
1.2	6.4	14.0	10.9
1.5	7.7	16.4	10.6
2.0	9.0	17.3	9.7

No. 6 burner, with slit 0.014 inch wide.			
0.3	1.4	2.6	9.3
0.5	3.7	9.6	12.6
0.7	4.7	12.6	13.5
1.0	6.1	15.7	12.9
1.2	7.0	17.7	12.7
1.5	8.5	19.5	11.5
2.0	9.0	19.5	11.5

Another bat's-wing, with slit 0.006 inch wide.			
0.4	3.2	9.1	14.2
0.6	3.7	17.2	13.1
0.8	7.1	23.6	13.9
1.0	9.3	27.9	16.3
1.2	9.3	30.8	16.6
1.5	10.2	32.6	15.7
1.8	11.1	33.9	14.9
2.0	11.8	34.0	14.4
Flares.			

It will be seen that the small quantity of gas passing through No. 1 union-jet becomes so mixed with air that even at 0.5 inch pressure the light emitted when burning 1.6 cubic feet per hour is only equal to 1 candle, or 3.1 candles when calculated for 5 feet consumption of gas. When the pressure is increased to 1.5 inches the results are still worse, for 3.2 cubic feet of gas per hour are burned with the production of light equal to 1.2 candles, or only 1.9 candles per 5 cubic feet of gas. With the larger sized union-jet the results are better; No. 3, when consuming 5.6 cubic feet of gas at 0.5 inch pressure, giving a light equal to 9.6 candles per 5 feet of gas. This amount of gas—3.8 cubic feet—when issuing under 0.5 inch pressure, is not mixed with so much air as the 3.2 cubic feet issuing under a pressure of 1.5 inches from the No. 1 burner.

The loss on the air supply of the increase of pressure, and consequently on the light produced, is also seen in the results of the experiments with the bat's-wing burners. If the result of burning 5.4 cubic

* The proceedings in connection with this inquiry were reported in the JOURNAL for Feb. 24, p. 291.

† See JOURNAL for June 3, p. 851.

‡ See JOURNAL, Vol. XXIII., p. 423.

feet of gas issuing from No. 2 bat's-wing, under a pressure of 1.5 inches is compared with the result of burning the amount of gas nearest to this amount in the case of each of the other burners, it will be seen that the illuminating power increases as the pressure required to send the desired amount of gas through the burner decreases; or, in other words, the illuminating power is increased as the gas, issuing with less velocity, is thus mixed or brought in contact with less air. The following figures taken from the above table show this:—

No. of Burner	Pressure of Gas	Cubic Feet of Gas used per Hour.	Illuminating Power in Standard Candles.	Illuminating Power per 5 Cubic Feet of Gas.
2	1.5	5.1	9.0	8.3
3	1.5	5.6	12.6	11.3
4	0.6	5.7	12.6	11.3
Large	1.0	5.7	12.6	11.3

It will also be observed, in examining the above tables, that in the case of each burner there is a certain consumption and a certain pressure which give the best result, and that at all other consumptions and pressures above or below this the results are worse. No. 6 union-jet, for instance, gave the best result when consuming 2.8 cubic feet of gas under 0.5 inch pressure; No. 2 bat's-wing gives the best result when consuming 2.8 cubic feet under 0.7 inch pressure; No. 6 bat's-wing, the best result when using 47 feet of gas under a pressure of 0.7 inch; and the large bat's-wing, when using 9.3 cubic feet of gas under a pressure of 1.2 inches. There is, therefore, a limit to the reduction of pressure causing an increase of the illuminating power of the gas consumed; and this limit is reached when the flame ceases to have a somewhat definite form, and burns in a languid, wavering manner, showing very low intensity of combustion, and having a tendency to smoke. In such cases the air is not supplied sufficiently for vigorous and intense combustion. This condition is illustrated in the above tables, and especially in the case of the bat's-wing burners. With each of these burners the gas issuing under the lowest pressures used produced less light than when higher pressures were used. Thus, for instance, No. 6 burner gives a light equal to only 9.3 candles per 5 cubic feet when the gas issues under a pressure 0.6 inch; the increase to 13.6 candles per 5 cubic feet when the pressure is increased to 0.7 inch. Again, with the large bat's-wing, having a slit 0.020 inch wide, the gas issuing at a pressure of 0.4 inch, gives a light equal to 14.2 candles per 5 cubic feet, whilst under a pressure of 1.2 inches the gas yields a light equal to 10.6 candles per 5 feet, a result even better than the standard Argand burner gives.

Another point to be noticed in the above tables is, that as larger burners are used, and larger quantities of gas burned, the illuminating power per 5 cubic feet is increased. Although the chief cause of this improvement is the better apportionment of the gas supply to the air, as required by the pressure, yet the increased volume of flame causing greater intensity of combustion, and preventing the cooling of the flame by the surrounding atmosphere, is doubtless another cause producing this improved result.

It has often been asserted that if gas be heated before it is burned, the illuminating power is improved, and some experiments made in the laboratory of the University of Manchester go to show that an increase of 15 per cent. in the illuminating power was produced by heating the gas from 64° to 285° Fahr. The London Gas Referees, in an able report on the construction of gas-burners, issued in 1871, repeated this experiment, and found no appreciable difference in the illuminating power of gas on heating the gas, before burning, from about 68° to 208° Fahr. One of us has recently tried the same experiment. The gas was caused to pass through about 6 feet of copper tubing, heated to dull redness. By this means the gas was heated from 56° up to 350°, as indicated by a thermometer placed, in the current of the gas, within 6 inches of the burner. It was found that the gas, when so heated, gave out, as the temperature rose, in order to pass exactly the required quantity of 5 cubic feet per hour, the heated and expanded gas requiring more time to pass through the burner than the same quantity of cold gas. Careful observations were made of the illuminating power as the temperature rose. The result was that no appreciable difference could be seen in the illuminating power even at the highest temperature reached—350° Fahr.—thus confirming the results obtained by the London Gas Referees. As the temperature of combustion would be increased by heating the gas, and consequently a higher degree of incandescence produced, some increase of the illuminating power might be expected, but the increase of temperature tried, and it is very difficult to heat the gas even so high as 350°, is evidently too insignificant to produce any appreciable increase in the illuminating power.

An experiment to try the effect of heating the air supplied to the burner, was more successful in producing an appreciable improvement in the illuminating power. The air was supplied from a holder under pressure. It was passed through a heated copper tube, and from thence into the bottom of the standard Argand burner, which was closed, excepting to the admission of the heated air. A thermometer was fixed, in the current of heated air, about 6 inches from the burner. There was no difficulty in heating the air to a temperature of 220° Fahr. At this last temperature of the apparatus gave way, so that no higher temperature was tried. The temperature of the unheated air was 70°, and the gas used, when supplied with this temperature, gave a light equal to 16 candles per 5 cubic feet per hour. As the temperature of the air was increased, the illuminating power gradually rose, until at 220° a light equal to 16 candles was produced—a rise of 1½ candles, or about 9 per cent., for an increase of 450° in the temperature of the air supply. As the amount of heat supplied by the heated air brought into contact with the gas and the flame is considerable, an appreciable effect is produced on the temperature of the flame, and consequently on its illuminating power. It would appear, however, that the principle of heating the air supply is not likely to be adopted for general lighting purposes, for the additional light which any practicable amount of heating would cause to be obtained, would probably not compensate for the extra cost and trouble attending the use of the required apparatus.

A number of burners of various kinds, now supplied to the public, have been tested with common coal gas having an illuminating power equal to 16 standard sperm candles when burned at the rate of 5 cubic feet per hour in Sugg's No. 1 "London" Argand burner, and the results obtained are given in the following tables. The standard candle, as in the case of each of the burners, is a burning 120 grains of tallow in the photometric apparatus, and the method of testing employed, were about the same as those described in the first part of this report. The two jets representing the candles were supplied with gas from a separate gasholder, always kept under exactly the same pressure. The gas consumed in the burner, as before, was also supplied from a separate holder, to which any required pressure could be readily applied. For comparison, the results obtained are calculated into the amount of light for a consumption of 5 cubic feet per hour in each case.

Of the four classes of burners described in the first part of this report, the rat-tail or single-jet burner is now seldom or never used for common gas for lighting purposes. The union-jet or flat-tail burner, the bat's wing burner, and the Argand burner, or modifications of these various burners, are now almost exclusively used. These burners and their modifications have for the most part been already fully described, and it is therefore unnecessary to repeat these descriptions at any length.

Messrs. Bray and Co. manufacture a great variety of flat-flame burners. Their "regulator" burner checks the pressure of gas in the mains by means of layers of muslin inserted in the burner. Their "special" burner, in addition to the layers of muslin, has also a piece of a kind of porcelain, containing a round hole of less area than the exit orifices, placed below the muslin, through which the gas passes into the burner. These "regulator" and "special" burners are made in three different forms—union-jets, bat's-wings, and a modification of the bat's-wing called a "slit-union." The latter, owing to a peculiar chamfering out of the head of the burner, forms a narrower and higher flame than the ordinary bat's-wing, and is, therefore, better adapted for use in globes. This form of bat's-wing is also made by various other makers. Besides the burners already mentioned, Messrs. Bray and Co. also make each form of burner of high lighting power and of medium lighting power, and they recommend the medium lighting power burners in preference to the others for general use, as having less tendency to smoke.

Of these burners of Messrs. Bray and Co., the following have been selected for trial:—

Bray's Medium Lighting Power "Regulator" Union-Jets.

No. of Burner.	At 0.5-Inch Pressure.			At 1.0-Inch Pressure.			At 1.5-Inch Pressure.		
	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.
1	2.0	2.1	5.3	3.2	2.2	3.4	4.4	2.3	2.6
2	2.6	3.0	5.8	4.0	4.0	5.0	5.4	4.3	4.6
3	3.2	3.6	5.6	4.3	4.9	5.7	5.8	4.4	4.7
4	3.4	6.1	8.9	5.3	5.5	8.0	7.1	10.2	7.2
5	3.8	7.8	10.2	6.1	11.6	9.5	8.3	13.4	8.1
6	4.4	10.2	11.6	6.8	11.0	10.4	9.0	14.8	9.0
7	4.6	12.0	12.9	7.2	19.2	13.3	9.7	24.5	12.7
8	5.2	15.8	15.2	8.6	27.3	15.8	11.5	Flares.	—

Bray's Medium Lighting Power "Special" Union-Jets.

No. of Burner.	At 0.5-Inch Pressure.			At 1.0-Inch Pressure.			At 1.5-Inch Pressure.		
	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.
1	2.1	3.0	7.1	3.1	4.2	6.8	4.2	5.0	6.0
2	2.3	4.3	9.3	3.7	6.5	8.8	5.1	8.0	7.8
3	2.5	4.6	9.2	3.9	6.5	8.3	5.3	8.1	7.5
4	2.9	5.7	9.8	4.5	8.0	10.6	6.0	10.2	8.7
5	3.2	6.8	10.9	5.2	11.8	11.3	7.0	15.2	10.9
6	3.6	8.6	11.9	5.8	13.7	11.8	8.0	17.6	11.6
7	4.2	10.6	12.6	6.6	17.6	13.3	8.8	22.2	13.2
8	4.8	12.8	14.2	7.3	22.3	15.4	10.1	31.1	15.8
9	4.8	13.6	14.2	7.7	24.0	15.6	10.4	32.5	15.6

Bray's Medium Lighting Power "Special" Slit-Unions.

No. of Burner.	At 0.5-Inch Pressure.			At 1.0-Inch Pressure.			At 1.5-Inch Pressure.		
	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.
1	1.9	3.9	10.3	3.1	6.5	10.5	4.2	8.9	10.6
2	2.2	4.4	11.3	3.5	8.0	12.0	4.3	9.8	11.8
3	2.8	6.5	11.3	4.5	11.0	12.2	6.1	15.6	12.8
4	3.0	7.2	12.0	4.9	12.8	13.0	6.6	17.2	13.2
5	3.2	8.0	12.0	5.2	13.6	13.6	7.3	19.4	13.3
6	3.8	10.2	13.4	6.2	17.4	14.0	8.3	23.6	14.2
7	4.1	11.0	13.4	6.6	19.1	14.5	8.9	26.0	14.6
8	4.8	13.2	13.8	7.6	24.1	15.5	10.1	32.0	15.4
9	5.3	15.2	14.3	8.5	26.0	15.8	11.4	37.0	16.2

Bray's High Lighting Power "Special" Union-Jets.

No. of Burner.	At 0.5-Inch Pressure.			At 1.0-Inch Pressure.			At 1.5-Inch Pressure.		
	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.
3	2.6	5.2	10.0	3.9	8.6	11.0	5.3	10.8	10.2
4	2.7	6.2	11.5	4.5	11.0	12.2	6.2	15.0	12.1
5	2.8	7.2	12.8	4.8	11.6	12.0	6.5	14.4	11.8
6	3.4	9.0	13.2	5.8	16.0	13.8	8.0	22.9	14.4
7	3.8	10.2	13.4	6.3	18.4	14.6	8.6	25.4	14.8
8	4.1	11.4	13.9	6.9	20.8	15.0	9.4	29.5	15.7

Bray's High Lighting Power "Special" Slit-Unions.

No. of Burner.	At 0.5-Inch Pressure.			At 1.0-Inch Pressure.			At 1.5-Inch Pressure.		
	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.
4	3.2	5.0	12.5	4.8	13.6	14.2	6.4	17.8	13.9
5	3.2	5.2	12.8	5.1	14.2	13.9	7.0	19.5	13.9
6	3.5	5.8	12.6	5.7	16.0	14.0	7.8	21.6	13.8
7	3.8	6.6	12.8	6.6	18.4	14.5	8.8	26.0	14.8
9	4.8	13.2	13.8	7.9	23.2	15.9	10.8	34.5	16.0

Bray's High Lighting Power "Special" Bat's-wings.

No. of Burner.	At 0.5-Inch Pressure.			At 1.0-Inch Pressure.			At 1.5-Inch Pressure.		
	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.
4	2.9	7.3	12.6	4.6	12.6	13.7	6.3	16.9	13.4
5	3.3	9.1	13.8	5.3	14.8	14.0	7.2	20.5	14.4
6	3.8	10.7	15.7	6.2	18.4	14.4	8.4	25.3	14.8
7	4.1	11.8	14.4	6.7	20.4	15.2	9.0	28.1	15.6

It will be noticed that in some of the union jet burners the lower numbers of them give very poor results with common gas. It is only when Nos. 4 and 5 are reached, and with a consumption of about 5 cubic feet of gas per hour, that good results are obtained. As a rule, all the burners burn to the greatest advantage when the pressure of gas is 1 inch.

Messrs. Bray and Co.'s market burner, intended (as its name implies) for use in the open air, also gives very excellent results from the somewhat large amounts of gas they consume. Two of them gave the following results:—

Bray's Market Burner—Bat's-wing.

No. of Burner.	At 0.5-Inch Pressure.			At 1.0-Inch Pressure.			At 1.5-Inch Pressure.		
	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.
Market	5.8	17.8	15.3	9.8	32.2	15.6	13.6	45.0	16.3
"	6.2	19.3	15.6	10.3	33.5	16.2	14.1	48.0	17.0

This firm has also recently manufactured some flat-flame burners of very large size, suitable for street illumination. These are made in an enlarged form of the slit union pattern, and called "standard" burners.

Another form of street burner—a "double-flame burner"—is made by them. This is formed by two burners being so placed that the flames from the two join together a little above the burner. We have not had an opportunity of testing the latter burners, but the large "standard" burners have been tested with 16-candle gas at pressures of 0.5 inch,

0.8 inch, and 1.0 inch, with the following results, which, it will be seen, are higher than those obtained with the standard Argand burner:—

Bray's Large "Standard" Burners for Street Lighting.

Mark of Burner.	At 0.5-Inch Pressure.			At 0.8-Inch Pressure.			At 1.0-Inch Pressure.		
	Cubic Feet of Gas nating per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas nating per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas nating per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.
30-candle.	11.0	37.1	16.9	15.0	49.3	16.1	19.0	60.5	16.0
40 "	12.7	43.2	17.0	18.4	60.8	16.5	21.2	72.0	17.0
50 "	15.0	48.8	16.5	19.3	63.6	16.9	23.6	80.0	16.9
60 "	13.3	41.2	16.5	18.2	60.8	16.6	23.6	77.9	16.5
70 "	16.0	52.3	16.4	21.9	73.6	16.8	25.0	84.8	16.9
80 "	16.5	55.0	16.6	22.7	74.9	16.5	27.2	87.7	16.1

Silber makes flat-flame burners in three forms—single, double, and triple bat's-wings. A wedge-shaped piece of brass is inserted between the heads of the two latter burners, for the purpose of directing air currents to the flame. The body of the burners in each case is large and vase-shaped. The results obtained by testing these burners are given in the following table:—

Silber's Flat-flame Burners—Single, Double, and Triple Bat's-wings.

Mark of Burner.	At 0.5-Inch Pressure.			At 1.0-Inch Pressure.			At 1.5-Inch Pressure.		
	Cubic Feet of Gas nating per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas nating per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas nating per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.
Single A.	1.2	2.1	8.8	1.7	3.6	10.6	2.4	4.8	10.0
B.	1.3	2.8	10.8	2.1	4.6	11.0	2.7	5.0	11.1
C.	2.6	5.8	11.2	3.9	10.0	12.8	5.0	13.6	13.6
D.	3.2	8.0	12.5	5.1	14.1	13.8	6.5	18.3	14.1
E.	3.3	8.2	13.0	5.2	15.0	14.4	6.9	19.3	14.9
F.	4.2	11.6	13.9	6.3	19.0	15.1	8.2	25.0	15.2
G.	4.8	13.2	13.7	7.1	21.0	14.8	9.2	27.0	14.7
Double H.	2.6	5.0	11.5	4.6	12.7	15.0	7.5	22.0	14.7
I.	3.3	7.4	11.2	5.1	16.2	15.0	7.5	22.0	14.7
J.	3.8	9.2	12.1	6.3	20.0	15.9	8.7	26.5	15.3
K.	4.3	10.9	12.6	7.0	22.3	15.9	9.5	31.0	16.2
Triple L.	4.4	9.0	10.2	7.8	21.6	15.1	11.0	36.0	16.5
M.	4.9	7.9	8.1	8.2	22.5	15.7	11.5	38.0	16.5
N.	4.9	8.4	8.6	8.5	24.0	13.6	13.1	43.3	16.6

The double and triple burners do not give good results excepting at the higher pressure. The double ones give smoky sluggish flames at 0.5 inch pressure, and the triple ones smoky and shapeless flames even at a pressure of 1 inch.

Besides other flat-flame burners, Sugg has recently manufactured a large burner for large consumption of gas, which he calls a "table-top" burner. This has a flat disc-shaped head with a semi-spherical centre, in which the slit is formed. Each burner is fitted with a governor. Two of these have been tested with the gas supplied to the governors at the undermentioned pressures, and the following results obtained:—

Sugg's "Table-Top" Burners.

Pressure of Gas in Inches.	Cubic Feet of Gas Used.	Illuminating Power per Five Cubic Feet.
0.5	3.8	10.0
1.0	8.3	15.0
2.0	8.3	24.8
3.0	8.4	25.2

Another Burner.

Pressure of Gas in Inches.	Cubic Feet of Gas Used.	Illuminating Power per Five Cubic Feet.
0.5	5.0	14.9
1.0	8.4	27.5
2.0	12.3	41.8
3.0	11.4	35.7

Brönners burners, already described in the first part of this report, have also been tested. They are made specially for use for common gas, as well as for canal gas. The A-top burners are intended for use in globes with common gas; and the B-top burners for use without globes, or in street lamps, also with common gas. The tops and bottoms of each burner are separately marked, and are interchangeable. The A-top burners are made with two sizes of tops and eleven sizes of bottoms. The B-top burners are made with eight sizes of tops and eleven sizes of bottoms. The following results were obtained with the A-top and B-top burners, using 16-candle gas.

Brönners's A-Top Burners for Use in Globes.

No. of Top.	No. of Bottom.	At 0.5-Inch Pressure.			At 1.0-Inch Pressure.			At 1.5-Inch Pressure.		
		Cubic Feet of Gas nating per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas nating per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas nating per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.
A 2	1	—	—	1.3	2.7	9.0	2.0	4.0	10.0	—
"	2	1.6	2.9	9.1	2.4	5.2	10.8	3.1	6.8	11.0
"	3	2.0	3.9	9.8	2.9	6.8	11.7	3.8	9.4	12.4
"	4	2.4	4.8	10.5	3.2	7.8	12.4	4.4	10.6	12.6
"	5	2.8	4.8	9.6	3.8	9.2	12.1	4.9	12.2	12.4
"	6	3.2	5.4	10.8	3.8	9.6	12.7	5.2	13.6	13.1
"	7	3.6	6.0	10.7	4.5	10.8	13.0	5.8	13.0	13.2
"	8	4.0	7.2	12.0	5.1	13.2	15.0	6.8	18.0	13.2
"	9	4.4	8.7	11.8	5.8	15.5	14.3	7.7	23.0	13.6
"	10	4.8	9.3	16.9	6.3	16.9	15.0	8.0	26.0	13.7
"	11	5.2	10.0	12.2	6.2	16.8	15.5	8.6	23.4	13.6

Brönners's B-Top Burners for Common Gas.

No. of Top.	No. of Bottom.	At 0.5-Inch Pressure.			At 1.0-Inch Pressure.			At 1.5-Inch Pressure.		
		Cubic Feet of Gas nating per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas nating per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.	Cubic Feet of Gas nating per Hour.	Illuminating Power per Five Cubic Feet.	Illuminating Power per Five Cubic Feet.
B 1	1	—	—	1.3	2.3	8.8	1.8	3.5	9.7	—
"	2	1.3	2.3	8.8	2.1	1.1	10.3	2.8	6.4	11.4
"	3	1.6	3.0	9.1	2.5	6.0	12.9	3.4	8.4	12.4
"	4	2.0	3.9	9.9	3.0	7.2	12.6	4.1	10.1	12.3
"	5	2.3	4.3	9.3	3.4	7.7	11.3	4.7	12.2	12.2
"	6	2.8	4.7	10.2	3.6	8.5	12.1	5.0	13.0	13.0
"	7	3.1	5.0	10.9	4.3	10.4	12.2	5.6	15.0	13.4
"	8	3.6	5.7	12.0	4.8	12.9	13.3	6.3	18.0	13.8
"	9	4.0	6.6	12.6	5.9	16.4	13.8	8.0	23.0	14.4
"	10	4.4	7.2	12.8	6.6	19.0	14.4	9.0	25.0	14.4
"	11	4.7	11.8	12.6	7.3	22.0	15.1	9.6	30.0	15.7

Harrison's "gas-light improver" is a device similar to that of Scholl applied to union-jets. It consists of a small plate of thin iron placed

across the top of the union-jet burner, against which the jets of gas impinge, thereby checking the force with which they mingle with the air. When the "improver" is applied to a burner with small holes, and when the gas issues under considerable pressure, the light-results are better than when no "improver" is applied, but it produces no improvement if applied to a good burner, of the same kind, in which the pressure has been already checked.

Of Argand burners, those manufactured by Sugg and Silber have been tested. It will be seen that by carefully controlling and directing the air supply much better results can be obtained than with the standard Argand used in testing. Each burner was tested with the consumption of gas to which it was best fitted, which was the largest quantity the burner will use without smoking.

The Silber Argand tried was one marked B. It was used with chimneys of various sizes, by means of which various quantities of gas could be consumed.

Silber's "B" Argand with Various Sized Chimneys.

Size of Chimney in Inches.	Cubic Feet of Gas Used.	Illuminating Power per Five Cubic Feet.
5 × 11	4.3	14.1
7 × 11	5.7	21.0
8 × 11	7.4	26.2
9 × 11	7.1	26.6
10 × 11	7.1	26.6

The following results were obtained in testing a series of Argand burners made by Sugg, which are called "Sugg's new reading lamp Argand burners." Each burner is fitted with a separate governor, to control the pressure of gas in the mains:—

Sugg's New Reading Lamp Argand Burners.

Mark of Burner.	No. of Holes.	Size of Chimney.	Cubic Feet of Gas per Hour.	Illuminating Power.	Illuminating Power per Five Cubic Feet.
A	15	6 × 13	3.2	9.6	15.0
B	15	6 × 13	3.7	11.8	16.0
C	21	6 × 13	4.0	12.8	16.0
D	24	7 × 13	4.4	13.8	16.0
E	20	7 × 13	4.7	14.2	17.2
F	20	7 × 13	5.6	16.0	17.3
G	33	8 × 13	6.6	24.2	17.2
H	36	9 × 13	8.9	37.0	16.9
I	36	9 × 13	9.9	39.0	16.9
K	42	9 × 13	8.5	29.0	18.2

Sugg has recently produced some very large Argand burners for street lighting purposes. These are made with concentric rings, from which the gas is supplied. Two of these, one a 100-candle burner, and the other a 300-candle burner, were tested with 16-candle gas, with the following results:—

Sugg's Large Street Argand Burners.

Description of Burner.	Cubic Feet of Gas per Hour.	Illuminating Power.	Illuminating Power per Five Cubic Ft.
50-candle burner with two concentric rings and a centre jet.	14.7	54.9	18.6
100-candle burner with two concentric rings and a centre jet.	26.0	96.0	18.4
Do. Do.	29.4	110.0	18.7
200-candle burner with three concentric rings and a centre jet.	32.0	196.0	18.8
Do. Do.	35.0	226.0	18.8

Although a greater amount of light can be obtained from the burning of common gas, in ordinary quantities, in good Argand burners than can be obtained by the use of flat-flame burners, yet there are many reasons for thinking that the latter are better adapted for general use, and that they will continue to be much more largely used for general lighting purposes than Argands. In the first place, the first cost of the Argand burner is necessarily very much greater. The cost of maintenance—replacing broken chimneys, &c.—is also very much greater. Then, again, the cleaning of the chimneys is troublesome. They must be kept clean, or a loss of light will result. A chimney which had been in constant use for 30 hours, burning Newcastle gas, was so dimmed by the deposition of what is probably sulphate of ammonia on the inside, that half a candle of the light was intercepted. If, from the irregularities of the pressure of gas in the main or from other cause, a larger amount of gas is passed through the burner than can be thoroughly consumed, the flame gives off dense smoke, which, if not at once stopped, produces very disastrous effects in rooms. Hence it is almost absolutely necessary to use a special governor to each burner, which adds still more to the cost. It is only when the consumption of gas for which the Argand burner is specially adapted is used, that the higher illuminating-power results are obtained. With smaller amounts the loss of light, by the excessive supply of air which then enters the chimney, is much greater than in the case of flat-flame burners of good quality. On burning various quantities of gas through the standard Argand burner used for testing, the following results were obtained:—

Cubic Feet of Gas per Hour.	Illuminating Power.	Illuminating Power per Five Cubic Feet.
2.5	2.5	3.0
3.0	5.0	8.3
3.4	7.9	11.6
4.0	11.0	13.8
4.3	14.3	15.8
5.0	16.0	16.0
5.2	17.8	17.8
5.7	17.8	15.1

By reducing the consumption of gas from 5 to 2.5 feet per hour, the illuminating power is reduced from 16 to 5 candles per 5 cubic feet.

The amount of light lost for illuminating purposes by the use of globes around the lights has been mentioned in the first part of this report. In many cases this loss is considerable, and the use of globes with narrow openings, and made of very opaque white glass, of the best and still wider ones at the top, the loss of light can be to a great extent avoided, the light being reflected by the white surfaces of the interior of the globe through the wide openings upwards and downwards.

From what has been frequently shown in this report it will be seen how important it is to have complete control over the pressure at which the gas is supplied to the burners in order to develop its light-giving properties to the best advantage. The first part of the report points out the various causes which give rise to great fluctuations of the pressure in the gas mains. In many towns the pressure may vary from less than 1 inch to 4 inches. No doubt the pressure as supplied to the burners can be

ment was everything that could be wished, and that Halifax had a just right to be proud of it as the work of the Corporation.

The motion was carried with cheering.

The President, in acknowledging the vote, said he was very much obliged to those present for their expressions of sympathy and goodwill. The best reward he could have for any little exertions he might have made in regard to the gathering, was to see so many present in so very out of the way a place, and at such a time of the year. He was glad to say that the Chairman and one other member of the Gas Committee were present, and he should have been glad if more could have been there. The Committee did not, however, trouble themselves a great deal about matters of this sort, but left them very much to their Engineer. He was, of course, glad that they were pleased with the works, about which he would not say more at this time; and all he would add was that he hoped the pleasure they felt at being present was in some degree approaching the pleasure he felt in welcoming them.

Alderman Riley responded for the Gas Committee, and said he regretted exceedingly that the Mayor was not present to welcome the Institution to Halifax. Business had called him away from home, or he would have been glad to avail himself of this opportunity of meeting them. He was glad that his friend Mr. Berry had made the remarks which he had. He was Chairman of the Gas Committee for many years, and he (Alderman Riley) learned from him and says that he was well possessed of the duties of the Gas Committee. He had now been Chairman of the Committee for some years—during the whole of the time that the extensions of the works were being carried out in fact; and he believed the residents enjoyed the full confidence of the Committee. He believed that many reforms had been introduced by Mr. Carr, for which the Halifax Corporation were most grateful, and which the ratepayers of the borough had good reason to value. He personally was very pleased to hear the flattering manner in which they had spoken of Mr. Carr. He had an entire superintendence of the works and of financial matters, and the result was very satisfactory to the Committee. Their profits last year were something like £12,000, and at an early date he (Alderman Riley) would recommend to the Town Council a substantial reduction in the price of gas. Now that gas was being sold to the consumer in the neighbouring town of Leeds at 1s. 10d. per 100 feet, with a discount of 2d. per 100 feet, he did not feel that it was right for Halifax to maintain the price at 3s. 4d. per 1000 feet. He could not see why these large profits should be wrung out of the consumers to relieve other rates. He was strongly of opinion that each department of a Corporation should be self-supporting, and it was not fair that gas engineers should give the other departments the means of being handicapped and be handicapped in this way. They did not get the credit of the results they obtained, and he did not think it fair that the profits made from gas should go to relieve the deficiencies on the water-works, or be employed in other ways to relieve rates. If there was any deficiency on the water-works, let a rate be made in aid of it; and he could, in carrying out these principles, very shortly move in the Council that the price of gas be reduced to 2s. 6d. per 1000 feet, with a discount thereon. There were in the town three or four large factories which made their own gas, and obtained the relief in rates which the gas profits afforded; and he thought that, by lowering the price to the rate he had named, they would not only put an end to the injustice of making consumers of Corporation gas pay something in aid of the rates of these people, but would perhaps induce them to abandon the manufacture of gas for their own consumption, and purchase it in future from the Corporation. With the gas-works in the state they were, he believed they could supply all the gas these factories might require. He hoped Mr. Carr would, as he was sure he would, do his best to make the members of the Institution comfortable during their stay in Halifax.

Mr. CORDINGLEY (a member of the Council) also expressed his pleasure at being present, and thanked Mr. Carr for having invited him.

This portion of the proceedings then ended, and the members adjourned to the Literary and Philosophical Society's Rooms, where the President again took the chair.

The HONORARY SECRETARY (Mr. R. Hunter, of Stalybridge), read the minutes of the last meeting, which were confirmed.

The following gentlemen were elected members of the Institution:—
 Mr. B. Askew Manager, Gas-Works Northwich.
 Mr. W. Romans Engineer and Manager, Gas-Works Rochdale.
 Mr. B. Turner Secretary and Manager, Gas-Works Milnrow.
 Mr. J. West Engineer, Corporation Gas-Works Manchester.
 (The two first-named were present, and were introduced to the meeting by the President.)

PRESIDENT'S ADDRESS.

The President then delivered the following address:—

Gentlemen,—In opening the proceedings of our forty-third quarterly meeting, allow me to express the pleasure I experience that this meeting is being held at Halifax. Apart, however, from the gratification I feel personally, I think it is the proper thing for an institution like ours to hold its meetings in different parts of the district from which its members are drawn, for, by the equality of the treatment of all the members, it gives us an opportunity of visiting different works in different parts of the country, and discussing what we see there; also of forming a much better opinion of the value of different improvements which may from time to time encounter, than could be formed by merely looking at drawings or verbal descriptions of them.

I cannot claim any very special advantage for the works you have viewed to-day over other works in other parts of the country, although when the site is taken into consideration, and it is remembered that the land upon which it stands was originally a slope of the hill falling rapidly to the edge of the bog that runs underneath the works, and forms the southern boundary of the old works (the inclination being in some places as much as 35° out of the horizontal), it will be seen that much has had to be done to make the works so compact and so well suited for the manufacture of gas as they are at present. When I look to any works which the foundation of the site in the early days cannot help regarding it as the most glaring example of the subjugation of an awkward site that I have ever either seen or heard of; and it speaks volumes for the dauntless energy of those engineers of the past who had the hardihood to commence and carry out the task of making a gas-works in such a place.

It would seem that many better sites might have been selected at the outset had the dimensions to which the works were to grow been dreamed of; but it is said that, when it was found necessary to increase the storage at the works, a gasholder 16 feet in diameter was put in. This was regarded as the best of a bad matter, and the statement was volunteered that the works could never require such storage capacity as this. We have now storage capacity, in round numbers, of 1,600,000 feet.

With regard to the present arrangement of the works and the site, as it now appears, circumstances have combined to render it peculiarly well adapted for the purpose for which it is applied. You will have seen that the inclination is taken advantage of in several ways, for instance, the coal siding is brought in at the highest level, the retorts, purifiers, &c., are on the middle level, while the coke yards are in the lower portion of the

works. In each case this arrangement does away with a considerable amount of labour that would otherwise be necessary. There is only one drawback to it all, and that is, it has cost so much to make that it has swollen our capital account to an extraordinary extent.

The new works, about which I am personally more concerned, have, as I consider, been put in at a very cheap rate. The works were contracted for and executed at a time when everything was at its lowest—we commenced operations about the same time that the appalling news came across the Atlantic that we were all to be snuffed out by the electric light. Mr. Edison had let a pair of pincers fall, and had discovered everything. Several members of the Halifax Town Council, and many residents of the town, advised the stoppage of the works, remarking that it was nothing short of madness to proceed with them at such a time. I took the responsibility of advising the Gas Committee to go on with the work, and I am glad to be able to say that they took my advice, and by thus getting the work done at such a time they saved themselves and the ratepayers a considerable sum of money. When I tell you that the works stood at, in round numbers, £220,000 for a capacity of 1,600,000 cubic feet per day, and to this has been added manufacturing plant equal to the production of 1,500,000 cubic feet per day, at a cost which will not exceed £35,000, you will understand that, considering the character of the buildings and the amount of money sunk in making the site, the works have been executed at a low rate.

Of the apparatus employed there is little that is novel, and the arrangement of the apparatus was in a great measure bound by the circumstances of the case, so that I make claim to very little originality. In the retort-house we have adopted Mr. Woodall's arrangement of hydraulic main and dip, with the exception of a few of the retorts upon which are fixed Holman's patent valvular seals. These were adopted with a view, if possible, to prevent the choking of the ascension-pipes; but we have not tried them sufficiently long for me to be able to speak with definiteness as to the result. There is also a wide variety shown in the arrangement of condensers. They are of the kind known as Graham's condensers. Finding that the pipes of large diameter, which are commonly employed, were not so effective as I could wish, I determined, instead of having one 18 or 20-inch pipe, to divide it into two of 14 inches. The only other apparatus to which I shall call your attention is the washer; or, rather, the two washers we have at the works, which I believe at the time they were introduced were quite original, although I see Mr. Young, in his notes read before the last meeting of the North British Association of Gas Managers, describes an apparatus somewhat similar. Beyond these the apparatus is such as you are all familiar with.

Our consumption of gas last year was 277,649,000 cubic feet, and this year it will probably be 300,000,000. The following is a brief analysis of the results of our last year's working:—

Halifax Corporation Gas-Works.

Analysis of the Cost of Gas for the Year ending Dec. 31, 1879.

	Cost per 1000 Feet.	Cost per 1000 Feet.
	s. d.	
Coal and cannel	12 10 0	11 60
Less residuals	10 15 2	4 10 09
Net cost of coal and cannel	1 575 16 10	1 51
Working expenses—		
Salaries and wages	5 260 10 8	6 10
Surfacing material	314 3 6	0 30
Maintenance of retorts, &c.	1 538 16 2	1 48
General workmen, repairs, &c.	2 117 5 9	2 14
Miscellaneous expenses	1 223 16 6	1 23
Rates and taxes	5 076 7 1	2 96
	14 239 18 8	14 83
Less meter rents		1 72 13 11
Cost of gas at consumers meters		14 62
Profit—		
Interest on capital	10 355 11 5	9 96
Sinking-fund	1 618 10 9	1 66
Renewal account	3 000 0 0	2 68
Balance absorbed by borough-fund	5 720 9 8	5 40
	23 734 11 10	22 83
Total profits		37 45
Price received per 1000 feet of gas sold		37 45

I give you these few particulars, gentlemen, as some kind of data to keep you in mind of your visit to Halifax; also that the example may be followed by other works, and that the same may be done. Each scrap of information is likely to be of service at some time or other. I will not detain you further, as we have a long and interesting programme to go through this afternoon.

The following paper by Mr. JOHN COLLINS, F.C.S., F.G.S., Analytical Chemist to the Borough of Bolton, was then read (in the absence of the Author) by Mr. Harrison Vevers:—

THE IMPURITIES IN GAS, AND THE MEANS OF ELIMINATING THEM.

It would be idle in me to occupy even the least portion of your valuable time in apologies for the introduction of a subject which must be, as it has been, a matter of grave concern to you all. Its importance to you as gas engineers and managers—engaged in the manufacture of illuminating gas, and in its economic distribution—can only be equalled by the amount of interest which is now being largely felt by a considerable portion of the intelligent public and by consumers. May we not be permitted to approach our subject by way of the suggestion that these impurities owe their existence in our gas to (1) the use of indifferent or ill-adapted material; (2) defective plant in the manufacture; (3) unskilful or careless management; or (4) all three causes?

In order that we may arrive at a proper estimate of the difficulties which would be involved in any attempt at the supply of "pure gas," even if this were desirable, we may profitably pay some little preliminary attention to the matters which we have in time to come. And here we must be much struck with the number and various qualities of the coals presented to our notice. Taking a good average coal, however, we may be allowed to state its composition as follows:—

Carbon	76.9	
Hydrogen	4.2	
Nitrogen	0.6	
Sulphur	0.7	
Water	11.3	
Ash	5.3	
		which = { Coal gas 31.27
		Ammoniacal water
		Tar 69.73
		Coke

I believe you broadly take it, that the best gas coal is that which, while yielding the highest percentage of illuminating gas, gives least sulphur and ash.

I have a pardonable fear of overweighing you with details in a paper which is necessarily of a discursive character; but nothing is more strikingly true than the enormous diversities in the qualities, and hence in the nature of the products of distillation, of these "gas coals." I append a table in which you will find examples illustrating this in an extraordinary degree.

We may now consider the general products of distillation, and may conveniently classify them as follows:—1. Illuminating gas. 2. Tar. 3. Ammoniacal liquor. 4. Coke.

1. Illuminating gas, consisting of

a. Light-yielding constituents	as	Gases, e.g. { Acetylene (Ethyli) } Vapours { Benzol (Naphthaline) } Hydrocarbons
b. Light bearers	as	Hydrogen. Carbon dioxide. Carbonic dioxide. Ammonia. Cyanogen and its sulphates. Dihydric sulphide. Carbon disulphide. Sulphuretted hydrocarbons. Nitrogen.
c. Impurities		

2. Tar, consisting of

a. Hydrocarbons which are liquid, as	Benzol. Tolnol. Cumol. Butyl. Naphthaline. Anthracene. Pyren.
" " solid, as	Carbolic. Cresylic (cresol). Rosolic. Creosote.
b. Acids	Aniline. Picric. Pyridine.
c. Bases	Anthracene. Empyreumatic resins. Carbon.
Asphaltine compounds.	Ammonic carbonate. " sulphide. " chloride. " cyanide. sulphonyanide.

3. Ammoniacal liquor, consisting mainly of	Carbon . . . 60 . . . 96 Iron sulph. . . 11 . . . 4 Ash
4. Coke, consisting of	

This table will exhibit the variety of the bye-products with which the gas engineer has to deal; and each of which, in its proper place, has its own importance and value.

The water which we have seen as forming over 10 per cent. of the product of distillation is partly pre-existent in the coal, and is partly formed by synthesis in the process. The ammoniacal liquor is mainly a combination of this water with the ammonia and other soluble compounds. The numerous hydrocarbon oils form the tar; and these, together with the water, are supposed to be separated from the condensers; for it is evident that only little condensation or interception can possibly take place in the highly heated ascension-pipes and hydraulic main.

The condenser is too well known to require any description. Its forms are numerous; but the principle and object of all is the lowering of the temperature of the gas as it passes from the hydraulic main, so that it may here deposit much of its watery matters. It is probable that too much has in some cases been made of the importance of this process. It has been said that purification is more than half effected by thorough condensation. And this may well be; but the results are not satisfactory. The gas passing from the retorts at a temperature of about 58° to 60° C.; and wherever the condensation may be effected, it should never be carried below a temperature of 10° to 11° C. When this is the case, either by accident or design, the gas is deprived of certain variable quantities of valuable hydrocarbons, and its illuminating power suffers in the same ratio. Besides, these hydrocarbons, so deposited, are a constant source of trouble and annoyance. Not only should the temperature of condensation be carefully watched; but the rate of condensation should be as low as possible, and a liberal allowance of tube area in the condenser will always prove most economical. The writer has recently found this area as low as 48 square feet of tube surface allowed for 100 cubic feet gas passing. It is believed this should never be under 90 to 100 square feet per 1000 feet of gas.

Coal naphtha is obtained by the distillation of coal tar. If we take this liquid and pass gas through and over it, we increase the illuminating power of our gas, while a disappearance of the "oxide of iron." The ordinary process, in fact, of straining of naphtha used in carburetted gas has given an increase of illuminating power equal to from 18 to 25 per cent.; but low and rapid condensation removes the greater part of this vapour, and the richest gas suffers most in this way.

It is not deemed necessary that we should pause in consideration of the action of the scrubbers, which may be said to complete all that mechanical purification can effect.

With the purifiers we have the first stage of chemical purification; and this purification may be dealt with under two main heads—viz., that effected by "lime" and that effected by "oxide of iron." The ordinary arrangements for purification by these reagents are familiar. The mode and extent, however, to which they do their work is probably less well understood. Lime has a strong affinity for moisture—dihydric sulphide—and carbonic acid; and hence, while the purifiers are in efficient working order, we should have no trace of these impurities present in the gas. But this extent of purification is rarely obtained, as will be seen from the tables appended. Oxide of iron then steps in to perform a function for which the lime is not adapted; and hence the general adoption of the two purifying materials. Oxide of iron removes the last traces of dihydric sulphide, while it has no affinity for carbonic dioxide.

The action appears to be something like the following:—The gas having deposited much of its tar and ammoniacal waters in the condensers, scrubbers, and wells, comes into very intimate contact with the lime, where the carbonic dioxide unites with the lime, forming calcic carbonate. The dihydric sulphide in similar fashion becomes broken up by the affinity of the sulphur and the lime for each other, and a formation of calcium sulphate is the result. But it is found that this calcic sulphide has a

strong affinity for the carbon disulphide and other sulphur compounds. The remaining unabated increment of dihydric sulphide, therefore, to what an extent this is daily effected will always depend on the state of efficiency and the attention paid to the purifiers and their action. The appended tables are very eloquent on this point.

It may be permitted here to give a tabulated analysis of spent oxide; which, while it indicates the direction in which it acts, also exhibits some unusual features:—

Water	13.2
Sulphur	63.6
Aluminous and silicious matters	9.1
Organic matters and loss	14.1

100.0

The sulphur purification of coal gas has an importance which cannot easily be over-estimated; and the question has been so recently investigated and reported upon in the JOURNAL OF GAS LIGHTING as to require little further notice here.

It must, however, be borne in mind that although we may obtain high photometric results, we may also have gas of still very low quality; and that it frequently happens that we have a very impure gas of a high illuminating power. It is within the knowledge of the writer that a recent report by an analyst (?) on the gas supplied by an important Lancashire corporation, asserted a gas to be 18-candle gas, and to contain (among other things) over 25 grains of sulphur per 100 cubic feet (!). If this were possible, it would not be difficult to admit the claim of a fussy and dilettante "chairman" that he personally, aided, by sundry means, original to himself, increased the income from ammoniacal sulphate sales by some thousands of pounds. Is it possible that the gas had also benefited by the more perfect removal of the ammoniacal compounds? and are not the consumers likely to derive the advantages which are to accrue from the supply of the gas by so much the purer and more wholesome? We might be pardoned for being tempted to suggest that a similar improvement—only to a greater extent—would be likely to accrue by a purification of the gas from 25 grains to say 14 grains, which is within easy reach even of the "amateur" management.

TABLE No. 1.—Selected Results of Analyses of Gas Coals.

Description.	Specific Gravity.	Fixed Carbon, Moist.	Volatile Matter.	Sulphur.	Ash in Coal.	Gas per Ton.	Caloric Power.	q. lb.	Per Cent.	Per Cent.
Bridgewater Cannal.	1.275	66.31	33.69	1.27	2.64	10,200	26.10	12	3	4.8
Arley Wigan . . .	1.278	66.98	33.02	1.53	2.29	9,783	18.13	13	1	3.8
Hilton House . . .	1.277	66.46	33.54	1.67	1.66	9,585	16.05	13	3	4.1
Ellerston . . .	1.277	66.46	33.54	1.97	2.91	9,618	16.64	12	2	6.67
Koscoe, Lord Stenholm	1.280	66.31	33.69	1.87	2.81	10,116	16.03	13	0	11.56
Scowcroft, Roschell .	1.269	65.81	34.19	1.69	1.53	9,743	12.1	10	6	1.26
Denton Collieries 1 .	1.282	59.74	40.26	1.32	2.73	10,616	18.00	11	9	12.13
Denton Collieries 2 .	1.292	63.51	36.49	1.91	2.97	9,087	18.00	12	1	6.34
Hulton Park . . .	1.271	62.49	37.60	0.35	2.50	9,976	18.00	12	1	8.04

TABLE No. 2.—Selected Results of Analyses of Gas.

Index Number to Sample.		Temperature.	100 Cubic Feet of Gas contains (Grains)					Illuminating Power.	Pressure.
			Water.	Carbonic Acid.	Carbonic Oxide.	Sulphur.	Ammonia.		
a. 173 . . .		206	2.17	3.11	2.11	21.6	1.31		
" 106 . . .		115	3.0	2.4	1.8	16.4	1.36		
" 110 . . .		202	2.02	5.27	19.2	2.06	1.86		
" 113 . . .		221	5.65	2.54	14.4	1.14	1.17		
" 301 . . .		516	3.03	4.43	38.6	1.6	1.64		
" 194 . . .		317	2.17	1.12	15.5	0.64	1.64		
" 143 . . .		117	1.92	5.66	13.16	1.15	1.15		
" 206 . . .		183	2.55	2.16	14.61	1.0	1.0		
" 115 . . .		329	3.06	2.83	20.3	1.0	1.0		
" 209 . . .		254	3.80	2.41	16.94	1.44	1.44		
" 15 . . .		184	3.16	2.97	15.37	2.65	2.65		
" 13 . . .		157	2.45	3.44	20.02	2.16	2.16		
" 613 . . .		217	4.02	2.01	17.05	1.21	1.21		

TABLE No. 3.—Tubular Analyses of Gas from Various Stages in Purifying.

	From CONDENSER.	From SCRUBBER.	From WASHER.	From FERRIC OXIDE.	From LIME.	Total Absorbed.
Hydrogen	380	380	380	380	380	—
Light carburetted hydrogen	309	386	385	384	394	—
Heavy carburetted hydrogen	43	43	43	45	44	—
Carbonic oxide	79	73	70	40	38	—
Carbonic dioxide	30	30	30	35	34	—
Sulphuretted hydrogen	17	13	4	3	6	—
Oxygen	3	0	2	5	—	—
Nitrogen	4	4	7	7	108	—
Ammonia	10	4	—	—	—	—
	1000	998	990	987	966	—

THE PRESIDENT'S INVITED DISCUSSION, AND

Mr. COLES (Tordmorden) said that if the author of the paper had been present they might have questioned some of the views which he expressed, but as Mr. Veevers was not prepared to clear up the difficulties which might occur to members, they could only regret the absence of Mr. Collins. It was a very good paper, as far as it went.

The President said Mr. Veevers had made a suggestion that they should postpone any discussion until the paper had been printed, and try and get Mr. Collins to attend the next meeting to answer any questions which members might wish to put to him. If Mr. Collins was willing to come to the next meeting they would have greater advantages of properly discussing the paper than they had now after having simply heard it read.

Mr. BRYAN (Beverley) said he had hoped that Mr. Collins would have told them some simple process of analysis which they could apply to discover the impurities in the gas without going into an elaborate chemical analysis. The paper was all very well as far as it went, but they could not, so far as Mr. Collins seemed to show, discover the impurities without going through a very elaborate analysis, which occupied a considerable amount of time, and required a great amount of knowledge. If there was some simple process it would be very useful in the hands of any manager who required a knowledge of the impurities he had to deal with. To carry out such experiments as those of Mr. Collins a great deal of storage would be required. They could not compare what was done one day with what was

done on the morrow, because the conditions might be very different. He was in the hope that Mr. Collins would have given them some hints which would have enabled them to arrive at results in the course of an hour or two, instead of undertaking an elaborate analysis which would occupy days.

Mr. COLLINS (Rochdale) said there were a great many apparatuses which were very simple, but if Mr. Bryan wished to make day-to-day tests, and compare the results of one day with those of the next, he would have great difficulty in doing so by an elaborate process of analysis. With apparatus which could be obtained, say, from Mr. Hartley or Mr. Sugg, they could save the gas in the laboratory, and they would be sure to get the ammonia, sulphur chlorides, and other impurities which they could eliminate from the gas. If they adopted the means which Mr. Hartley told them of they could do it, and the operation was very simple; they had simply to attach a pipe, turn a tap, and the apparatus worked itself. He did not know whether he quite understood what Mr. Collins meant, but there was one portion of the paper to which he took exception. He was himself in favour of lime purification for gas, and had been all his life; and he could not for the life of him imagine any impurity which lime would not remove that oxide of iron would take out. The oxide would do what it was made for and no more, but lime would do all if it was rightly used.

The PRESIDENT thought Mr. Roman's remarks deserved the meaning of Mr. Collins's expression. He fancied that Mr. Collins agreed with Mr. Romans that lime would do what oxide would not.

Mr. ROMANS owed Mr. Collins an apology if this was so. He might say for himself, however, that if he knew what to do with his "blue bill" — if the chemist could assist him to get rid of it—he would use no other purifier than lime.

Mr. ASKEW (Northwich) was also of opinion that there were no impurities oxide of iron would remove which lime would not at some stage.

The HONORARY SECRETARY read over the portion of the paper upon which some questions had been put.

Mr. ROMANS said it was the very proposition which he disputed.

Mr. NEWBING said he was very glad Mr. Vevers had made the suggestion that the paper should not be discussed at the present meeting, because if Mr. Collins were present he (Mr. Newbwing) should be inclined to take him to task most severely for having presented such a very unbusinesslike paper at a meeting of the directors. For the reason that Mr. Collins was not there, he should say no more about it. He had the same impression as Mr. Romans, with regard to the lime and oxide of iron methods of purification. The opinion Mr. Collins had advanced was altogether contrary to their knowledge and practical experience, and if on a future occasion Mr. Collins did not mind of the directors and present his paper for discussion, he hoped he would have used the interval to revise it, and also that he would introduce a few facts about which there could be some discussion. Certainly what had been presented to them that day was of a most elementary character. There was nothing that they did not all understand perfectly by word of mouth, as he had said, if the alleged facts were correct, there would be less objection to it.

The PRESIDENT, replying to an observation of the last speaker, said Mr. Collins would not have an opportunity of revising the paper unless he personally desired it, because the paper as read ought to be printed in the *Franchise* of the Institution. So they might have an opportunity of reading it over. If they could induce Mr. Collins to attend the next meeting and discuss the paper, they would be sure, all be very glad to see him, in spite of the remarks of Mr. Newbwing, which he was surprised to hear, because, although he had not followed the paper very clearly, he thought Mr. Collins had said nothing which he could not substantiate. As to the "alleged facts" as Mr. Newbwing called them, with reference to oxide of iron and lime, they were perfectly correct so far as his (the President's) experience went; and he did not think Mr. Collins had overstepped the line in a single instance. As Mr. Collins was absent, he (the President) felt the greater pleasure in making these remarks. There was a great thing to find fault with an analytical chemist, especially if he was, as Mr. Newbwing said, only dealing with elementary principles, but as regarded Mr. Collins's position in writing the paper they had heard read, they ought to bear in mind that he was outside their profession, that he had no knowledge how they would meet on a paper of this kind, and that he might have been as much surprised the mark they should have a little charity. It might be that he had no information as to what would be exactly the best form in which to present the subject, but this was his misfortune rather than his fault, because he had not attended any of their meetings. He (the President) hoped that what Mr. Collins would find fault with he might as much have done on this particular subject as those who made a profession of chemical knowledge.

[The report of the subsequent proceedings at the meeting will be given next week.]

EASTBOURNE GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday, the 23rd ult.—Dr. JEFFERY in the chair—when the following report was presented:—

The Directors have the pleasure to declare that the business for the half year, ending June 30th, has been satisfactory. The profit for that period amounted to £2935 8s. 10d., which, added to £993 8s. 3d. (balance brought forward from last account), will give a total of £3928 18s. 3d. available for dividend. The Directors, therefore, recommend that a dividend of the rate of 10 per cent. be declared on the ordinary shares, and that £20,000 original capital of the Company, and a dividend at the rate of 7 per cent. per annum upon the £30,000 capital raised on B shares, which will absorb £2050, leaving a balance of £1598 18s. 3d. to be carried forward to the next account.

In accordance with the resolution passed at the special meeting of Shareholders, held on the 2nd day of February last, the Bill for raising further capital and other powers was approved of, and passed by Parliament. The Directors, acting on the advice of their Consulting Engineer, Mr. H. E. Jones, obtained what are generally known as the "sliding scale clauses," the initial price being fixed at 4s. 4d. per 1000 feet.

The Directors trust that the result of the decision will be satisfactory both to the Shareholders and also to the consumers.

The Directors propose to reduce the price of gas to the public as from the 1st day of October next from 4s. 7d. to 4s. 4d. per 1000 cubic feet.

The Directors present a deficiency on the capital account of the Company of £2599 18s. 8d., and it is estimated that further sums, amounting together to £1400 18s. 4d., will be necessary to meet the great increase in the business of the Company. The Directors, therefore, propose to ask the Shareholders for power to raise the further sum of £10,000, by the issue of new shares under the powers contained in the new Act. In accordance with the provisions of that Act, the shares will have to be put up by public auction or by tender, as may be determined by the Company. The Directors recommend that the shares shall be put up for public tender.

The CHAIRMAN proposed the adoption of the report, which, he said, was so lucidly drawn that any remarks of his upon the position it explained were altogether unnecessary.

The report was seconded, and agreed to; after which the meeting proceeded to the election of Directors in the place of those retiring by rotation—Dr. G. A. Jeffery, Mr. T. Arkcoll, and Mr. B. Bradford—but who were eligible for re-election.

Mr. F. W. ARKCOLL proposed, and Mr. S. JONES seconded the re-election of these three able and gentlemanly men, and a most strange circumstance occurred. A Mr. James Morris was proposed as a Director

by a Shareholder, who thought they wanted "a little fresh blood in the directorate." Whereupon the names of the retiring Directors were singly put to the meeting, and, no hand being held up against any of the three, they were declared elected. On Mr. Morris asking whether he was not entitled to be voted for, the Chairman said: "There can be no room for a fourth, as you have elected the three." The Shareholder who proposed Mr. Morris's election then claimed a poll; but this was ruled against by the Secretary, on the ground that there must be "some opposition demonstrated by the person applying for a poll." After much protestation, the matter ended by Mr. Morris declaring that they had not been "acted fairly by," and that the three Directors had been "elected by a fluke."

The retiring Auditor (Mr. Josiah Brown) was then re-appointed.

On the question of the remuneration of the Directors, it was at first proposed to increase it from £200 to £500 a year; but, after some conversation, this was reduced to £400. The motion having been put to the meeting, was declared to be lost by 12 votes to 14, but, on a challenge, the position was reversed, the resolution being carried by 69 to 59 votes—reckoned according to the holding of the various Proprietors.

The remuneration of the Auditor was fixed at £10 10s., being an increase of four guineas a year.

Some correspondence then ensued as to the gas supply and the alleged insufficiency of the pressure at which it was delivered.

A vote of thanks having been passed to Mr. Jones, the Engineer of the Company, and to Mr. Darlington, the Manager.

Mr. DARLINGTON said he was exceedingly obliged for the compliment paid to him. This mark of confidence gave him an opportunity of alluding to the question of pressure. When he came down to take charge of the works, he found that an excessive pressure was constantly applied. He had made a reduction, which he could declare had not been deviated from except on one occasion—viz., Christmas Eve. His pressure papers, which he had to produce, showed that the pressure had been reduced, ranging from 6-10ths to 10-10ths, and at night from 10-10ths to 20-10ths. He should like to point out to those gentlemen who complained, that he had reduced the leakage in the mains to a large extent, effecting a saving to the Company of a considerable amount.

An Extraordinary Meeting of the Company was then held, the only business in connection with which was the mode of raising the additional £10,000 that the Directors had recommended to be raised, in opposition to the recommendation of the Board, that the shares be sold by auction, rather than put up to tender. Counter resolutions were duly proposed, and 11 votes were given for each; on which the Chairman gave a casting vote in favour of offering the shares by tender.

A vote of thanks to the Directors closed the meeting.

WOLVERHAMPTON GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Tuesday—Mr. J. UNDERHILL in the chair.

The SECRETARY (Mr. A. Jones) read the following report:—

Your Directors have much pleasure in presenting their fifty-seventh half-yearly statement of accounts and general balance sheet, duly certified by your Auditor, showing the profit for the half year, ending June 30th, to be £10,348 18s. 11d., and a balance of profit £3086 11s. 11d., which added to the balance of last account, amounts to £2416 0s. 4d. From this your Directors recommend the payment of a 5 per cent. dividend upon the £10,000 stock, and 3 per cent. (less income-tax) upon the paid-up capital of the preference shares.

During the past half year the usual alterations and repairs at both stations have been kept ahead. Your works are in thorough order, and your Directors have every confidence of being able to meet any increased demand for gas that may arise.

Your Directors have also great pleasure in informing you that their new offices and premises now completed, in the position of the Company, and they trust that the accommodation afforded will be duly appreciated by the Shareholders and the general public, and produce commensurate advantages to the Company.

Your Directors have only to repeat the thanks for the confidence reposed in them by the Shareholders, and to assure them of their continued attention to the important interests committed to their care.

The CHAIRMAN, in moving the adoption of the report, said he thought that it was as favourable as usual. Before he commenced to make any comments upon it, however, he thought it his duty to draw the Shareholders' attention to the larger profits of the Company. The Directors, he said, hoped now to be able to concentrate the whole of their varied branches together, which they had not hitherto been able to do. They would have a much better showroom for the display of articles in connection with the gasfitting trade in which they dealt, and they hoped this would prove a great advantage to the Company and their customers. In carrying out the work the Directors had gone a little beyond their usual practice. In other words, they had been obliged to take up a somewhat larger proportion than usual of the amount required to pay the half-yearly dividend from the balance in hand, reducing the balance from the total of £1399, at which it stood last year, about £400, the amount now in hand. At the same time, the Shareholders were nearly all aware that at this time of the year they did not usually make sufficient profit to pay the customary dividend for the summer half of the year; but as in previous years, they looked forward to making up the difference out of the larger profits of the winter half of the year, and they had no doubt that they would find this would be the case when they again met, and that the profit on the next six months would be sufficient not only to pay the next half-yearly dividend, but also to make good the present deficiency. They had not, however, on this occasion even, he was glad to say, had to trench upon the reserve fund, although the fund was available at any time for any equalization of dividend that might be required. He might state that the Board had not forgotten the promise they held out some time ago of reducing the price of gas, whenever the opportunity occurred for their so doing; but owing to the bad state of trade during the past year, and the fact that their balance at the present had been reduced for the causes he had mentioned, rather low, he was not able to say when the reduction would take place. So soon, however, as the Directors saw their way clear, in justice to the Company, to do so, they would certainly give the public the advantage of a further reduction. It was very glad to say the gas was of good quality, and that the work had been well completed, and their position now was such that they would be able to supply whatever demand the consumers might make upon them, and give them a supply of gas of good quality, and sufficient in quantity to meet all possible requirements.

On a second reading of the motion, and it was carried unanimously.

The CHAIRMAN next proposed the payment of the dividends recommended in the report, which was seconded by Mr. IRONMONGER, and agreed to.

Mr. TOTTEY proposed a vote of thanks to the Chairman and the Directors for their services during the past half year, and congratulated them upon the prosperous position of the Company.

Mr. P. CREMONINI, in seconding the motion, said he had known the Chairman and the Directors nearly all his life, and he had every confidence that they would do their best for the future prosperity of the Company, and that they would do the best for the public whom they were serving.

The CHAIRMAN acknowledged the compliment paid to his colleagues and himself, which would, he said, if anything were wanted, be an incentive

Dr. DAVIES seconded the motion, and it was carried.

Mr. LEWIS, in acknowledging the vote, said he must express his obligations to Mr. Storr for the assistance rendered by him during the Company's late application to Parliament. Although Mr. Wyatt's name was on the plans, it was more ornamental than otherwise, and in reality Mr. Storr did the engineering work.

Mr. STORR, on behalf of himself and the remaining officers, thanked the meeting for the expression of their confidence, and assured them they had at heart the best interests of the Company, and he expressed the hope that in the future the work would be carried on with as much success as in the past.

A vote of thanks to the Chairman for presiding closed the meeting.

BOLTON CORPORATION GAS SUPPLY.

The following are some particulars of the working of the Bolton Corporation gas undertaking for the year ended June 30 last, compared with the year ended June 30, 1879:—

	June, 1880.	Year ending June, 1879.
Gas made	442,354,000 cub. ft.	428,294,000 cub. ft.
Gas sold and used in the works	414,466,000 "	388,469,000 "
Loss	27,888,000 "	39,825,000 "
	or 6.3 per cent.	or 9.31 per cent.
Canal and coal carbonized.	42,276 tons.	40,850 tons.
Waste of gas per cent.	10,463 cub. ft.	10,157 cub. ft.

The works and plant account shows an expenditure on June 30 last of **£47,367 6s. 5d.** This is made up as follows:—

Amount expended to June 30, 1879, viz.:		
Works and plant	£285,386 5 6	
Bonus to shareholders of old Company	22,750 0 0	
Capitalization of annuities	155,538 12 6	
		£463,674 8 14
Amount expended in year to June 30, 1880, viz.:		
Hired meters	£3,401 0 10	
Apparatus	973 16 4	
Chief rent	998 12 2	
Chief rent	164 10 7	
Railway sidings	740 5 5	
Retorts	453 11 6	
	£8,086 13 6	
Less old metal sold	414 5 3	
		7,672 8 1
Total		£471,367 6 5

There was expenditure during the past twelve months, from the renewal account 4948 14s. 9d.; while 49749 6s. 2d. was transferred to it from the revenue account.

The revenue account compared for the past two years is as follows:—

Expenditure.	
	Year ending June 30, 1880.
Canal and coal consumed	£24,901 2 1
Wages for gas manufacture	5,374 19 1
Time and purifying	1,484 0 11
Retorts, materials and labour	1,431 5 11
Repairs of ironwork and brickwork	3,670 14 3
Water	184 1 8
General expenses	896 15 4
Salaries	3,103 19 8
Rates and taxes	1,882 1 0
Bad debts	452 6 2
Office expenses, stationery, and printing	452 6 2
Law charges	20 7 3
Bad debts	204 9 5
Meters and fittings	5,045 10 3
Ammoniacal salt	2,712 5 3
	£50,988 16 7
Balance	44,777 10 4
	£95,766 6 11

Receipts.	
	Year ending June 30, 1880.
By Gas rental	£69,567 15 0
Meter-rents	1,817 12 2
Meters and fittings	6,253 18 2
Coke	4,396 15 3
Tar	3,830 14 5
Spent lime	204 9 5
Ammoniacal salt	9,519 10 3
Rents	114 3 6
Sundries	47 0 10
Bank interest, less commission	568 1 10
Transfer fees	—
	£92,766 6 11

The above amount of **£44,777 10s. 4d.** on the debit side of revenue account was appropriated in the following way:—£4908 9s. 11d. to interest on £14,560 14s. 9d. to annuities; 4979 8s. 2d. to the sinking-fund; 49742 6s. 2d., as already stated, to the renewal fund; 44697 1s. 6d. to the reserve-fund; and £10,000 to the district-funds.

LEICESTER CORPORATION GAS SUPPLY.

At a special meeting of the Leicester Town Council held last Tuesday—the Mayor (Alderman Bennett) presiding—the following report from the Gas Committee was presented:—

The Gas Committee have to report that they have carefully considered the memorial from gas-lighters and ironmongers, which was presented to the Council at the last meeting and referred to the committee for their report thereon.

The substance of the complaint of the memorialists is as follows:—1. That they are injuriously affected by the action of the Gas Committee. 2. That the rate charged for gas is low as to prevent competition. 3. That they were induced under a false impression to purchase large stocks. 4. That their trade in stoves was extinguished by the circular of May 21 last.

Before dealing with the complaints of the memorialists, your Committee think it desirable that they should refer to the circumstances which led to the decision by them to let cooking stoves on hire.

It is necessary that the producing power of the gas-works and the capacity of the mains should be equal to the greatest demand in any one day; and during the summer months only a small portion of the manufacturing plant is used, and in the daytime the mains are comparatively idle. Now, as more than half the cost of gas consists of fixed charges, and of interest upon capital, it follows that it would be obvious to the Council, that there must be a very large profit upon any addition to the day consumption.

It appeared to your Committee that the day consumption might be materially increased if the prejudice of the public could be removed, and that cooking by gas became a more general practice; but as the sale of gas cooking stoves had been in the hands of the memorialists ever since the introduction of gas into Leicester, and the limited number of persons who had been induced to purchase stoves, and how largely they had failed in their efforts, your Committee decided to imitate the example set by the Corporation of Birmingham, which had been followed by other corporations and companies with very great success.

As very little was known in Leicester about cooking by gas, and as there was a great deal of prejudice against it, your Committee thought it expedient, before commencing to let on hire, to hold an exhibition of various kinds of stoves in order that consumers might have their prejudices removed and see the advantages of using gas in preference to coal.

The exhibition was not taken up heartily by local firemen or ironmongers as was done at Nottingham and London, and in fact only one of the exhibitors, Messrs. Gurney and Co., and very few indeed took any part in it whatever. Nevertheless it was a great success, a large number of stoves were sold to the public by the exhibitors, and 320 have since been let on hire by your Committee.

About a month before the exhibition, circulars were sent to those likely to exhibit, informing them that, after the exhibition was over, cooking stoves would be let on hire by the Gas Committee, and that the exhibition was the only one of the kind that there can be no doubt but the intention of the Committee was well known; in fact the Chairman of your Committee, in some remarks by him at the opening of the exhibition, made special reference to the letting of stoves, and it was so reported in the local newspapers. It is also a fact that Mr. Dennis Paul, Mr. Coleman, and Mr. Porter (the honorary secretary to the memorialists), were personally told of the intention of the Committee.

Your Committee think that the above statement renders unnecessary any further reference to the third complaint "that the memorialists were induced under a false impression to purchase large stocks;" and as to their complaints (first) "that they have been injuriously affected by the action of the Committee," and (fourth) "that their trade in stoves had been extinguished," it has been shown that very few stoves had been sold in use previous to the exhibition, and that there was in fact hardly any trade to extinguish. But some consumers feel sure that the majority of those who now hire stoves will prefer to purchase when they have had an opportunity of satisfying themselves as to which stove will suit them best; and as the Committee have decided not to sell stoves, your Committee think that the consumers are not let down, and that the income from rents will cover interest and depreciation, indeed offers have already been received from the makers of two of the stoves to re-instate them at the end of 7 years, at a price which, added to interest, will be more than covered by rents, and although the price which the makers of the other stove propose to charge for repairs is somewhat higher in proportion, there are so few of them in use as not materially to affect the question, and a disposition has also been shown in the makers of the two stoves to accept of the terms proposed by the Committee.

The number of stoves in use is now 320, and the cost with interest and maintenance for 7 years is estimated as follows:—

	E. s. d.	E. s. d.
First size—Rent for 7 years at 2s.	0 14 0	
Interest for 7 years and renewal at end of time	0 12 7½	
Profit for 7 years	0 1 4½ × 169 = 11 12 4½	

Second size—Rent for 7 years, at 6s. 2 2 0
Interest for 7 years and renewal at end of time 2 1 7½

Profit for 7 years 0 0 4½ × 124 = 2 9 1
Rent for 7 years at 10s., 3 10 0

Third size—Interest for 7 years and renewal at end of time 3 37 31
Rent for 7 years at 10s., 3 10 0

Loss for 7 years 0 7 3¼ × 27 = 9 16 10½

Estimated gain at end of 7 years on 320 stoves, which at that time will be "as good as new" 4 4 7

But if the makers of the 27 stoves reduce their price for renewing, as it is expected they will, this gain will be considerably increased, and if they do not, the Committee may probably adopt some course to secure it in the future.

It may probably be argued by the memorialists that hirers of stoves will not keep them in the year through, and that the calculation of the Committee will therefore be upset; but it should be understood that it is not the intention of your Committee to allow the stoves to be hired for a portion of the year only. No intimation of this sort has as yet been made to applicants, but if any stoves are ordered to be removed (say during the winter months) the Committee propose not to allow them to be refixed except on a yearly rental, so that the estimated income will be secured. In any case the profit on gas consumed will be so considerable that if no rent whatever were charged the Committee are sanguine that benefit would result to the department. As an illustration, the consumption is given, upon an average of 40 days, of the 38 consumers who first had stoves on hire.

Consumption of 38 consumers with stoves fixed upon an average of 40 days 181,900 feet.
Consumption of the same 38 consumers for the corresponding period of last year 83,800

Increase by 38 stoves for 40 days 97,400 feet.

Which is equal to a profit of about £380 a year upon the 320 stoves already in use. Only 38 consumers can as yet be taken as an illustration, because only that number have had stoves in use for the whole period between the two last inspections of meters.

Your Committee may mention that they received a deputation from the memorialists, introduced and supported by their solicitor (Mr. Owston), and that their representations were fully considered by your Committee at a special meeting held for the purpose. It will be obvious to the Council that under the circumstances the course adopted by the primary object of the Committee being to secure the consumption of gas—it would have been inexpedient to fix the stove rents at a rate equal to what would recommend it as a speculation in itself. Yet, however, satisfied that if they succeed in popularizing the use of gas for cooking purposes the memorialists will ultimately be substantially benefited in their business by this new enterprise.

As to the suggestion that the estimated income of the letting of stoves ought to be increased, a course not recommended, your Committee trust they will not require that the advance should be more than 5 per cent.—i.e., 15 per cent. on the only.

Your Committee are not unmindful of the responsibility conferred upon them by the Council in the management of a concern of the cost of which was nearly half a million of money. The result of their experience, as far as at present reported, has, they venture to think, been satisfactory to the Council and the town, and the earnest desire of your Committee is that the confidence and the success of the past may be fully maintained.

There is an important fact which must not be lost sight of—viz., that since the commencement of the undertaking by the Corporation, new capital to the extent of £10,000 has been expended, and this is necessitated for the present, and no doubt for some years to come, to meet the requirements of a few weeks in the very middle of the winter when the demand for gas is so great that if the satisfaction of the public is to be maintained, there must be no lack of energetic and vigilant management. The course pursued by your Committee is one which they venture to think would not be omitted in private business enterprises, and if pursued by the Corporation, it is the opinion of your Committee has been, and is, that this large undertaking should be managed on behalf of the general ratepayers on purely business principles.

Mr. DOWNING (Chairman of the Gas Committee) moved, and Alderman KEMPSON seconded, the adoption of the report; the former stating that it dealt with the whole matter that anything he could say would be mere repetition.

Considerable discussion then ensued, in the course of which an amendment was proposed to refer the report back to the Committee for consideration of the various objections which had been made to the different charges.

The Council were pretty evenly divided on the question; for, on the votes being taken, there appeared 16 for the amendment and 18 against it. On the original motion, which was put, it was carried by a majority of 2 votes.

TRADE NOTES FROM SCOTLAND.
(FROM OUR OWN CORRESPONDENT.)

A monthly meeting of the Dundee Gas Commissioners was held last Wednesday, when, amongst other things, the Finance Committee reported that a considerable increase had been made in the valuation of the gas-works for the current year, the Assessor having disallowed tenants' profits. It was remitted to the Convener, Clerk, and Treasurer to see the Assessor, with power to appeal in the event of no satisfactory arrangement being come to.

The annual general meeting of the Carnoustie Gaslight Company was held last Wednesday—Mr. John Borrie, Chairman of the Company, presiding. The balance sheet for the year ending August, 1880, was laid before the meeting. After allowing for working expenses, deterioration of plant, and bad debts written off, it recommended that a dividend of 7½ per cent. on the capital stock of the Company be declared. The statement was approved of, and the retiring Directors—Mr. John Smith, Mr. Alexander Paton, and Captain John Mitchell—were unanimously re-elected, as also were the Auditors, Messrs D. Kidd and J. P. Morrison.

On behalf of the Aberdeen Town Council, it is proposed to promote an Improvement Bill in Parliament during next session, asking powers to borrow about £150,000, a large portion of which is intended for carrying out improvements in the gas-works and in connection with the water supply of the city.

At the usual monthly meeting of the Glasgow Town Council, held last Thursday, there were submitted the minutes of the Gas Committee, the chief item of which was the question of waste of gas reported in connection with stair-lamps, both within the municipality and in the suburban burghs. The details, which were contained in two reports by the Manager, showed evidence of most wilful waste and carelessness on the part of the tenants of the Company. The Committee, however, decided that they were to be dealt with by a Special Sub-Committee to consider and report as to the terms and conditions upon which supplies of gas for stair-lamps, both within and without the municipality, should hereafter be granted, so as to obviate such irregularities as were complained of. Mr. Macdonald was elected a Special Sub-Committee member. The Committee's report that a certain number of lights were not burning for which the parties had not contracted for the gas. (The Lord Provost: A few.) If that were so, he said distinctly that whoever they were—small or big—they had committed theft, and ought to be prosecuted accordingly. There was nothing in the matter; any party who would lead a pipe into his house, or premises, for stair-light or anything else, and not contract for the gas, was committing nothing less than theft.

On Friday last a Commissioner in connection with the New Zealand Harbour inspected the gas-lit buoy (Pintch's) at the Roseneath Patch, opposite Greenock, and also received from Mr. Hardie, of the Clyde Light-house Trust, information in relation to the working of the buoy, &c. There is a likelihood of similar buoys being adopted by the Trust represented by the Commissioner in question.

An advance was made on Friday in the price of the Glasgow Corporation Gas 6 per Cent. Annuities, from £166 10s. to £168; but no business was done and the market was not advanced.

Further progress has lately been made by the Local Authority of the burgh of Lanark towards carrying out their proposed water-supply scheme. They have let the contract for cutting and filling up the pipe track of about 7 miles in length, and laying and jointing the pipes. The contract for the construction of the level tank has also been let. Mr. James Watson, Manager for the Dundee Water Commissioners, is the Engineer for the new works.

Important extensions are to be made in connection with the water-supply works for Bo'ness, the plans for which have been prepared by Mr. Stirling, C.E., Edinburgh.

The Water Commissioners for the parish of Dundonald, which includes the burgh of Irvine, recently held their half-yearly statutory meeting, when the Clerk submitted an account of the total cost of the water supply works, as completed some time ago. Including preliminary expenses, Provision for Order, &c., down to the final miscellaneous outlays, the cost was £24,400.

For the first time since the water supply undertaking for Glasgow passed into the hands of the Town Council, the Gorbals Gravitation Water-Works were visited on Saturday by the Lord-Provost and his brother Water Commissioners, along with Mr. Gale, the Engineer, and Mr. Wilson, the Treasurer. The view is progressing, and the importance of considerable importance and extent, the cost of which will be about £18,000.

A considerable number of places in the West of Scotland are at present in great straits for want of water, or in great fear of an impending water famine. Dumbarton, Ardrossan, Greenock, Maybole, Helensburgh, and other towns are now referring to the water supply as a matter of grave, but splendid, harvest fever seems to have now drawn to a close, and therefore the fears of a water famine may be expected to vanish.

No material change took place during the past week either in the pig-iron market or in the Glasgow coal market. The price of pig iron at the end of the Friday stood 52s. 6d. cash, and coal seems to be weaker in price, as the miners on strike lose confidence in their cause.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade throughout the district continues miserably quiet, the demand for all descriptions of round coal being still of the most limited possible description. Except, however, the stocks already held, which in some cases are not only very heavy, but of long standing, there is not much to be done down on the coast. The colliery proprietors are generally just working on to what orders they can get. The full average time at present being worked by the majority of the pits is not more than about seven days a fortnight. There is no alteration from last month in the nominal quotations, but there are really no fixed selling prices, and as there is a great deal of pressure to secure orders very low figures have to be taken.

The gas coal season is now practically over, and what little coal there is still to be bought cannot materially affect what I have already stated with regard to the trade. The season has been remarkable, not only for the extremely low prices which have been ruling in the market, but for the extraordinarily long periods for which contracts have been taken, deliveries over three years having been about the average, whilst several important contracts have been made extending over five years. For good Lancashire screened gas coal, delivered at works, the average price has not been higher than 8s. per ton, and a very large quantity of gas coal has been sold under this figure. Cannel has not been pressed quite so much as gas coal, but still extremely low figures have been taken.

In the iron trade business has been very quiet, and although list quotations are about the same as last week matters have been easier to deal with, and generally there is a disposition to take less money to secure orders. Lancashire, Derbyshire, and Lincolnshire pig irons, which were the only brands really selling in this market, are to be bought at from 48s. 6d. to 50s. per ton, less 2½, delivered equal to Manchester; and local bars at about 46 2s. 6d. to 46 5s. per ton.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The brisk run which has been noted in the pig iron trade, together with the steady and continued operations of the finished iron manufacturers throughout the past quarter, have apparently had the effect of increasing the output of coal in this district. Though no perceptibly augmented calls have at any time been witnessed in the market, yet the present demand, when compared with that of three or four months ago, shows that very decided progress has been made. There is too now a very fair outlook for all kinds of iron making fuel, and forge coal especially in good request at the present low rate of prices. Though household qualities are still plentiful there is a fair tonnage being raised. The pits, however, are far from producing the bulk of which they are capable, and there are but few employed full time. Notwithstanding this, business is on the whole improving, and with the autumn crops, hand, and a continuation of the improved state of the iron market, prospects are looked upon as favourable. Cokes of all descriptions are selling better, and the sales are of an extended character. An uneasy and anxious feeling still exists with regard to the efforts of those localities which are seeking to exempt themselves from the operation of the Mines Drainage Act; it being maintained by a number of the largest colliery proprietors that the yoke of taxation is oppressive to them, and that as regulated at present the small colliery owners do not bear a fair average part of the rates.

In all the branches of the iron trade business is of a steady character. The quotations of the past few weeks still rule, though in some few instances sellers are more firm. Offers for bulk at lower rates meet with but few takers. In the pig trade the majority of inquiries are for second-class qualities. Finished iron is in more request for the colonies than it has been of late. The home market, as regards the release of the quarter, somewhat restricted to immediate requirements. Marked bars are firm at 48, but the call at this figure is of a limited character, and intending purchasers are holding back orders with the idea that some alteration will be made in the standard price; on the approach of quarter for the second time, however, they are showing no signs of releasing the price at which marked bars have been fixed. As compared with the secondary qualities, the run on best bars has been of a limited character throughout the quarter, as also it was a remarkable feature of the previous quarter. Boiler plates are quoted at 410; best sheets (double) 46, but in a few months are given. Single sheet iron is steady, at 48 to 49 7s. 6d. hoops at 47 4s. 6d. and strips at 10s. to 10 6s. 6d. sell freely at 43 for part mine; and hot air realize 43 to 43 10s. Cinder pig is plentiful at 42, though higher figures are sometimes reached. Ironstone is in good request, and most of the quarries are being fully worked. Heavy ironfounders are well employed, and tube-makers and galvanizers have a decent share of orders yet on hand.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade throughout the whole of the county is more or less depressed, and the pits continue to be worked, if not at a loss, with a very small margin of profit. Many of the largest collieries in South Yorkshire are now working at a loss, and the owners are considering the desirability of closing until a more prosperous period makes its appearance. It is a striking fact that, whilst in the years 1873 and 1874, the Inspector of Mines had notice of over 100 collieries which were about to be sunk or opened out, in the five years ending 1879 rather over 100 pits and seams were certified as being abandoned, most of which were given up because they did not pay.

The steam coal trade during the week has been active, and a large tonnage has found its way to the Humber ports, both from the South and West Yorkshire pits. The exports hold well up, particularly those intended for the Baltic and other northern ports. Many of the collieries in the West Riding are sending largely to Hull, having the advantage of rather more than 1s. per ton over South Yorkshire owners in the rate. The Denaby Main and Manvers Main pits have, however, sent very largely by both rail and water, whilst Carlton Main has contributed nearly 5000 tons to the coal and iron trade ports. Prices of the class of coals, as usual, some South Yorkshire owners having tendered at 6s. 3d. per ton for the winter months.

Considering the state of trade, several of the gas coal producing pits are doing a very nice business in that class. There is also a fair inquiry for iron fuel, and the Lancashire and Yorkshire districts of Yorkshire; but prices have rather given way owing to the consumption of small coal and slack being less for coke making.

A more unsatisfactory state of things can scarcely exist in the labour market. The men who are earning low wages, while masters are losing money, are acting on the false assumption that owners are endeavouring to force upon them a general reduction. The officials, too, of the South Yorkshire Miners Association are agitating for amalgamating the various associations. It may, however, be safely said that the men are powerless, having no funds and next to no unity amongst them. Important changes have already taken place with regard to the management of the North Derbyshire Coalowners Association. Mr. Thomas Parsonson, who has been Secretary since the formation of the Union, having resigned.

There is very little news to note with respect to the iron trade. In some quarters it is believed a better tone pervades business, but as yet it is not perceptible. The blast furnaces are kept fully going, and a good deal of pig iron is turned out. Foreign demand for mill material is but little sought after, whilst the engineering trade is quiet.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The gas coal trade was busy last week. There were several inquiries with a view to contracting, and shipments were considerable. The harvest being well over in the south, the shipments of cargoes by small sailers for the by-ports was comparatively numerous. Gas coals are now being sent away to the Baltic pretty freely, and the demand is healthy all round. Some of the larger collieries are holding off for higher prices, which is keeping the market open as regards contracts, but it is probable that within the next ten days the collieries and contractors will come to terms. The coasting and London business as is usual will begin to increase over September. Steam and second-class coals are in a slightly improved position. There have lately been large shipments of coke over sea, especially to the Baltic.

A large number of coasting sailers were chartered last week, and on Saturday the market was quite clear of seeking vessels. At the same time a fleet of vessels was expected from the South. Some large steamers have been freighted to load gas coals for the Italian ports, and over sea or by rail, and generally there is a disposition to take less money to secure orders. The manufacturing business of the North is steady. There is not a very great demand for iron, but the factories and foundries are fairly well off for business. The shipment of the better sorts of fireclay goods and firebricks from the leading factories is very well sustained, but the other con-

cents are short of orders, and some continue to add to stock. The lead trade is very much duller. Prices of lead are steady at about £1 per ton lower for the month upon recent sales. All kinds of building material, though much better than last year, are in moderate demand. The labour market generally shows no surplus of workmen in any branch of business. Skilled workmen and labourers alike are in employment.

BELEER GAS COMPANY.—The statement of the accounts of this Company, presented at the last yearly meeting last Tuesday, showed a profit for the quarter of 1879 of £237 15s. 10d., and the expenditure £1875 17s. 3d., leaving a balance of £251 18s. 7d. Of this amount the sum of £405 5s. 1d. was available for dividend at the rate of 5 per cent. for the half year.

MITCHEM AND WIMBLEDON GAS COMPANY.—The half-yearly meeting of this Company was held on Tuesday last, when the continued prosperity of the undertaking enabled the Directors to recommend the usual 5 per cent. dividend. Votes of thanks and confidence were conferred on the Chairman, Directors, and all the Officers of the Company, the Auditors (Mr. E. Sandell and Mr. J. Wade) receiving the further compliment of an increase of fee.

SALES OF GAS AND WATER SHARES.—At a recent sale by auction of shares in the Chatham and Rochester Water-Works Company, a number of £5 shares realized, after keen competition, £10 15s. per share. Some shares in the Sheerness Gas Company were at the same time disposed of, the £10 shares being sold at £17 12s. each. On the 26th ult., 12 shares of £10 each, fully paid, in the Newington (Hull) Water Company, Limited, were sold after a keen competition, sold by auction at £2 6s. per share. On the 30th ult., 50 fully paid-up shares of £10 each in the Louth Water-Works Company were sold by auction at prices ranging from £5 2s. 6d. to £5 5s. each.

TUNBRIDGE WELLS WATER SUPPLY.—At the meeting of the Tunbridge Wells Improvement Commissioners last Wednesday, the Water-Works Committee presented a special report, in which they again recommended the scheme of 1876, of storing the surplus water as a fresh means of obtaining enough water to meet the increased supply required. They recapitulated the numerous schemes, including those of obtaining water from various places and also by boring, which latter they thought might do much and render their present works useless. A lengthy discussion ensued, in the course of which it was stated that the carrying out of the scheme would cost £39,000. The consideration of the matter was ultimately adjourned for a month.

MAIDSTONE WATER-WORKS COMPANY.—The ordinary half-yearly meeting of this Company was held on Thursday, the 26th ult., when the report of the Directors on the working of the Company for the half year was presented. This stated that for the quarter ended Dec. 31, 1879, the Company received for water-rents the sum of £1252 8s. 2d.; for the quarter ended March 31 last, the sum of £1340 19s. 2d.; and for the quarter which ended June 30, it is estimated the rents will amount to about £1380. The balance-sheet showed a profit for the past half year of £106 6s. 3d. The report contained the following statement:—"A final but unsuccessful attempt has been made during the quarter in the well at Barning, the effort being conducted by Messrs. Doughty and Sons, and their investigations led them to recommend the Directors to relinquish the idea of obtaining water from the well. The cost of the works at the well was £405 5s. 1d., and the Directors have paid this amount out of the reserve-fund."

SUFFOCATION BY GAS IN GLASGOW.—On Friday, the 20th ult., a woman named Allan was found dead in her house, 407, Great Eastern Road, Glasgow, under the following circumstances:—For some days previously an escape of gas caused annoyance to the neighbours in the property, but it was only on the day named above that a gasfitter was sent for to discover the source. For a time his efforts were fruitless, but at last he was led to the conclusion that it proceeded from Mrs. Allan's house. As there was no response made to a knock to open, the door was forced, when the inmate was found lying dead on the floor, and the house filled with gas. She deceased was just seen alive on the previous Midday afternoon; but the escape of gas was felt on Tuesday, it having evidently prevailed through the night. There were no gas brackets in Mrs. Allan's house, but a pipe passed underneath the flooring, and on being examined a breakage was discovered, sufficient to allow the gas to escape in great volume.

PARTICK, HILLBRAD, AND MARVELL GAS COMPANY.—The tenth annual meeting of this Company was held on Friday, the 27th ult. The Provost of Edinburgh was the chairman, and the address which was presented showed a profit, including last year's balance, of £6908 2s. 11d., which the Directors recommended should be apportioned as follows, viz.:—First, a dividend of 5½ per cent. on the preference shares, £1650; second, a dividend of 4½ per cent. on the ordinary shares, free of income tax, £4418 2s. 2d.; third, an addition to the depreciation-fund of £600; fourth, the balance of £238 19s. 11d. to be carried forward—total, £6908 2s. 11d. The Directors referred with pleasure to the progress that has been made in the extension of the Company's business, notwithstanding the reduction in the price of gas and residual products. They anticipate that with improvement there will be a considerable increase in the receipts during the current year. The number of meters now in use is 9254. Contracts for coal have been concluded on very favourable terms, extending over a period of 18 months. The report was adopted, on the motion of the Chairman, seconded by Mr. McLean.

THE PROPOSED PURCHASE OF THE CLAY CROSS WATER-WORKS BY THE LOCAL BOARD.—It may be remembered that about this time last year a number of the ratepayers in the district of the Clay Cross Local Board met for the purpose of considering the scale of charges made by the Local Water Company. Since that time several meetings of ratepayers have been held on the subject, and in January the Directors made a reduction of 10d. to 15d. on all charges, but refused to alter any of the other charges. In March a meeting was held and a deputation chosen to wait on the Local Board and request that body to make an offer of £9000 for the works, the original capital of the Company consisting of 3000 shares of £3 each, fully paid up, and maximum dividends of 10 per cent. have been promised by the Shareholders during the 25 years of the existence of the works. The offer was made, and in reply the Directors, in refusing the same, said that if a sum of £13,000 was offered the purchase might be considered. The question was again discussed by the Local Board, and resulted in an offer of £12,000. An extraordinary meeting of the Shareholders of the Company has just been held to consider the matter, when only about six Shareholders, besides the Directors, were present. The offer was decidedly refused.

THE WATER SUPPLY OF BRADFORD-ON-AVON.—In a letter addressed to one of the local papers, Mr. Henry Tomlinson, the Engineer to the Trowbridge Water Company, and who is also Engineer and Manager of the Gloucester and Trowbridge Water Company, says:—"The Shareholders in the Trowbridge Water Company who reside in and are connected with Cambridge, (possessing £33,100 of the £36,900 share capital—the remainder being held in Trowbridge (£2900) and the vicinity (£900)—have expressed a wish to the Directors that they should publicly state

their views upon the Bradford Water Supply. I am therefore requested to say that the Directors have refrained from making any overtures, or offer, while the Bradford Commissioners endeavoured to obtain a supply of water; but in compliance with the suggestion above alluded to, they think it well to let it be known, that in the event of the Commissioners failing to get a good and sufficient supply in other ways, the Company are prepared to purchase the stock of pipes of the Commissioners and do all necessary works for supplying water to Bradford on the same terms as those in operation at Trowbridge and Melksham, providing powers be given them by the Local Government Board, or if necessary by unopposed application to Parliament, or, under the existing powers of the Company to supply the water in bulk, on the most reasonable terms, with a sliding scale—low as 3d. per 1000 gallons."

GLOSCEP GAS COMPANY.—The half-yearly general meeting of this Company was held on Monday last week—Mr. Charles Greaves in the chair—when the Directors reported that, notwithstanding the reduction made from Dec. 31, 1879, of 3d. per 1000 feet in the price of gas, and 2d. per meter per quarter on 2 and 3-light meters, the profit on the past half year's working enabled them to recommend maximum dividends on all classes of shares (including the "C" shares created in March last), besides paying £360 towards arrears of dividend in former years. The accounts are presented in the form prescribed in the Company's Act of last year—according to the schedule of the Gas-Works Clauses Act, 1871. The amount to the credit of revenue account is £1564 5s. 3d., which with the undivided balance of £937 10s. 3½d. carried forward from the previous half year, amounts to £1927 15s. 6½d., out of which the Board proposed to declare a dividend as follows:—

On 600 original £10 shares fully paid up, at the rate of 10 per cent. per annum.	£300 0 0
" 600 original £5 do. do. 10 per cent. p. an.	150 0 0
" 1800 New £10 do. do. 7½ do. do.	675 0 0
" 125 B £10 do. do. 7½ do. do.	233 2 6
" 675 C £10 do. do. 7 do. (for 3 mos.)	21 17 6
	£1,400 0 0
And in payment towards arrears of dividend:—	
On 600 original £10 shares at 5s. 6d. per share.	£150 0 0
" 600 do. £5 do. 2s. 6d. do.	150 0 0
" 1800 new £10 do. 1s. 6d. do.	135 0 0
	360 0 0
	£1,760 0 0

Carrying to the credit of reserve-fund	£58 5 6
Leaving a balance to carry forward to next half year	109 10 0½
	167 15 6½

£1,927 15s. 6½d.
In March last, the report continues, 250 new shares—called "C" shares—were offered by public auction and realized the sum of £3227 15s., showing a premium of £727 15s., which, after deducting £12 10s. 6d. for share certificates, printing, advertising, and expenses of sale, &c., leaves £715 4s. 6d. to carry to the credit of capital account—not subject to dividend. Of the new capital raised the balance of the parliamentary expenses, amounting to £1396 5s. 11d., and other payments for new manufacturing and distributing plant have been made. The Directors say that encouraged by the highly satisfactory returns of the past half year, they contemplate making a further reduction in price commencing Oct. 1st, feeling confident that with economical management a favourable balance-sheet can be presented at the end of the current half year.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 3477.—HAWORTH, J., Blackburn, Lancs., "Improvements in apparatus for regulating the consumption of gas." Aug. 27, 1880.
3478.—WILSON, E., and MORLEY, J., Bermondsey, London, "Folding gas or oil flaps for preventing the passage of gases from main sewers into lateral sewers." Aug. 28, 1880.
3512.—ATLEYBERRY, H., Bristol, "Improvements in gas-engines or motors." Aug. 30, 1880.
3558.—PHILLIPSON, B. R., Dublin, "An improved valve for admission of air into water-pipes and the like." Sept. 1, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 833.—VERNON, A. H., Hackney, London, "Improvements in taps or cocks for liquids, steam, air, and other fluids." Feb. 25, 1880.
919.—MACLEANE, J. W., Lanark, N.B., "Improvements in apparatus for the manufacture and treatment of cast-iron pipes, columns, and similar articles." March 2, 1880.
962.—HYND, D., Dundee, N.B., "Improvements in lamps." March 5, 1880.
1220.—PIPPER, C., Berlin, "Improvements in and relating to gas generators and in gas-burning furnaces connected with them." A communication. March 29, 1880.
1594.—QUESNEL, L., Paris, "Improvements in gas soldering irons." April 19, 1880.
2229.—CLARKE, G. L., and LEIGH, J., Manchester, "Improvements in the construction of apparatus for lighting gas, part of which apparatus is also applicable to other electrical apparatus." June 1, 1880.
2604.—TOMAS, J. T. C., Minorca, London, "Improvements in lighting and heating apparatus." June 26, 1880.
2787.—PIRT, S., Sutton, Surrey, "Improvements in gas apparatus." A communication. July 7, 1880.
2770.—MARTIN, M., Clenchery Lane, London, "Improvements in machines for cutting screw threads on pipes and couplings." A communication. July 7, 1880.

PATENTS WHICH HAVE BECOME VOID

- BY REASON OF THE EXPIRATION OF THE TERM OF THE DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.
2552.—LAKE, W. R., "Improvements in apparatus for heating water by gas." July 3, 1877.
2644.—HADDAN, P. W., "An improved liquid or water meter or water-power engine." July 3, 1877.
2647.—MELNINE, T., "Improvements in water-meters or apparatus for measuring and registering the quantity of water or other fluid flowing through pipes or other conduits." July 10, 1877.
2659.—RENNICK, C., "Improved apparatus for lighting and extinguishing gas." July 10, 1877.
2710.—MORRISON, W., "A new and improved automatic gas-lighter." July 14, 1877.
2749.—SNOW, L., "Improvements connected with atmospheric gas-engines." July 18, 1877.

Share List of Gas and Water Companies.

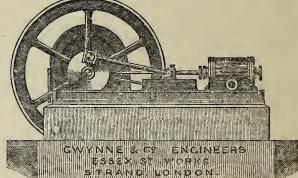
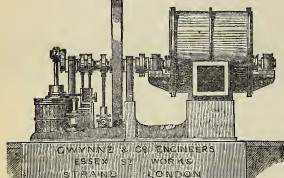
Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Div. p. Cent.	Latest Quotations.	Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Div. p. Cent.	Latest Quotations.	Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Div. p. Cent.	Latest Quotations.
589944	£	GAS COMPANIES, Alliance and Dublin	10 0 10	0 0	17-17½	6200	5	GAS COMPANIES, Georgetown, Guiana	5 0 0	7 0 0	41-41	300000	£	GAS COMPANIES, South Metropolitan	100 0 11	15 0	200-205
10000	20	Anglo-Romano	10 0 10	0 0	21-25	300000	100	Glasgow Corporation Gas	100 0 0	9 0 0	205-210	130000	Sk.	Do., "B" & "Ed."	100 0 0	*	182-187
5000	20	Bath (Limited).	10 0 10	0 0	15-16	115000	100	Do., do.	100 0 0	6 15 0	155-160	2800	10	Tottenham & Falmouth	5 0 0	10 0	9-10
1000	20	Do., 1st pref.	10 0 10	0 0	25-27	100	100	Grimby Gas, A.	100 0 0	0 0	15-16	1500	10	Do., "A" & "B"	5 0 0	7 0 0	
1500	20	Do., 2nd pref.	10 0 10	0 0	20-22	100	100	Hong Kong (Lim.)	10 0 10	0 0	15-16	1500	10	Do., "C" & "D"	10 0 0	7 10 0	123-134
40000	5	Bombay (Limited).	5 0 0	7 10 0	61-62	7000	10	Horsney	10 0 10	0 0	15-16	4000	10	Do., "E" & "F"	10 0 0	7 10 0	114-123
10000	5	Do., fourth issue.	4 0 0	7 0 0	3-4 pm.	5000	100	Imperial Continental	100 0 0	0 0	101-104	20000	5	West Ham	5 0 0	10 0	91-94
10000	10	Bournemouth	10 0 0	0 0	13-14	20000	100	Kingston	100 0 0	0 0	111-123	2000	5	West Kent	10 0 0	10 0	15-16
227000	100	Brentford	100 0 0	9 0 0	150-153	20000	100	Lea Bridge	100 0 0	0 0	111-123	2100	5	Woolwich, Plumstead, and Charlton	5 0 0	16 0	9-10
..	..	Do., 5th et. pref.	100 0 0	5 0 0	95-100	20000	100	Do., B	100 0 0	0 0	111-123			* Surrey capital, 11 per cent.			
20	20	Do., D shares	18 0 0	9 0 0	8-9	20000	100	Do., C	100 0 0	0 0	111-123			Phoenix capital, 10 per cent.			
1400	20	Brighton	20 0 10	0 0	35-36	20000	100	Do., D	100 0 0	0 0	111-123						
5000	20	Brighton and Hove	20 0 10	0 0	35-37	20000	100	Do., E	100 0 0	0 0	111-123						
14000	20	British (Limited).	20 0 10	0 0	35-37	20000	100	Do., F	100 0 0	0 0	111-123						
7252	20	Capitani (Limited).	20 0 10	0 0	17-18	20000	100	Do., G	100 0 0	0 0	111-123						
1500	10	Colony Hatch	10 0 0	5 0 0	9-11	20000	100	Do., H	100 0 0	0 0	111-123						
55000	Sk.	Commercial	100 0 0	11 5 0	195-200	20000	100	Do., I	100 0 0	0 0	111-123						
70000	Sk.	Do., 7 per cent.	100 0 0	8 5 0	153-160	20000	100	Do., J	100 0 0	0 0	111-123						
20000	20	Continental Union	20 0 0	6 10 0	21-22	20000	100	Do., K	100 0 0	0 0	111-123						
10000	20	Do., new	14 0 0	6 10 0	21-22	20000	100	Do., L	100 0 0	0 0	111-123						
10000	20	Do., preference	20 0 0	7 0 0	241-254	20000	100	Do., M	100 0 0	0 0	111-123						
75000	Sk.	Crystal Palace District	100 0 0	10 0 0	172-177	20000	100	Do., N	100 0 0	0 0	111-123						
125000	Sk.	Do., 7 per cent.	100 0 0	7 0 0	122-127	20000	100	Do., O	100 0 0	0 0	111-123						
50000	Sk.	Do., preference	100 0 0	6 0 0	118-122	20000	100	Do., P	100 0 0	0 0	111-123						
25000	6	Do., ordin. 7 p. c.	1 4 0	7 0 0	1-3 pm.	20000	100	Do., Q	100 0 0	0 0	111-123						
7100	25	Edinburgh	25 0 10	0 0	46-48	20000	100	Do., R	100 0 0	0 0	111-123						
22446	10	European (Limited)	10 0 10	0 0	193-201	20000	100	Do., S	100 0 0	0 0	111-123						
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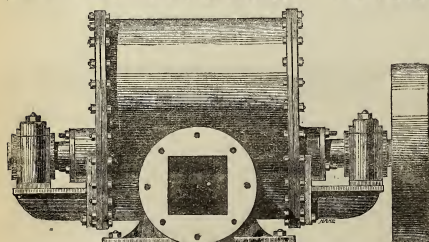
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PHENIX ENGINEERING WORKS:

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TO CORRESPONDENTS.

J. B.—Your letter, which is in type, is unavoidably held over till next week.

C. S.—Too late for notice this week.

We must repeat a notice we have frequently given, that communications intended for the forthcoming number of the JOURNAL should reach the Office by Saturday morning.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 14, 1880.

Circular to Gas Companies.

On the last day of the late session of Parliament, Mr. Arthur Arnold, for Sir George Campbell, gave notice of a motion for next session, to call attention "to the excessive badness and cost of the London gas, and the bad quality of the coal of which it is made, and to move that measures should be taken to compel the Companies having a monopoly of gas supply in London to make the gas as good as that supplied in Edinburgh and other towns." The coming session is generally expected to be full of surprises, and likely to be occupied with several measures of reform having reference to things political, administrative, and social; but one of the greatest surprises it could offer would be the spectacle of any practical result arising from this motion of Sir George Campbell's, and among all possible projects of reform it is most unlikely that the upsetting of the gas legislation of the Metropolis for a generation will be included. The Government will have too much other work on their hands to care to support the member for Kirkcaldy in his self-appointed crusade against the Gas Companies, and unless

we are greatly mistaken both in the man and the matter he has taken in hand, he will scarcely be able to imitate the procedure or emulate the fame of Mr. Plimsoll, who, upon a memorable occasion, fought the House of Commons and the Government single-handed, and won. What the Gas Companies have done at this time to rouse Sir George Campbell's ire, and why Sir George Campbell has undertaken their castigation, are twin mysteries which we are unable to solve, even if they were worth the trouble of an inquiry. Patriotism may have something to do with it, for although a large quantity of Scotch cannel is used in London, the bulk of the coal carbonized is English; yet this cannot be the sole reason, unless we are to believe that Sir George Campbell is more patriotic, or parochial, than other Scotch members. The worthy knight is, however, somewhat erratic in his choice of subjects for attack, and no less catholic in his pursuit. Turks and missionaries, gumbaks and gas companies, are all game for him; his mental grasp includes them all, and he apparently feels capable of discoursing on the intricacies of a diplomatic settlement or delivering a lecture on the illuminating power and chemical composition of gas with equal authority. But facts are notoriously "chiefs that winna ding," as Sir George's compatriots would say; and however safely that gentleman may disport himself among the intangible expressions of general politics, where opinions and not facts form the subject of debate, it is plain that he knows nothing whatever about the realities of gas polity, and that the "border" which separates England from Scotland in gas matters is not found in his mental geography. It is too late to-day to discuss the difference between Edinburgh and London in respect of gas supply. Sir George Campbell does not appear to know of any distinction other than that one is all good and the other all bad. Such a want of instruction in one of our legislators is deplorable, and the member for Kirkcaldy cannot be better occupied during the recess than in consulting one or two experts, whose counsel, if after a little rudimentary instruction he persists in his notion, may prevent the "excessive badness" from being more conspicuous in his own arguments than in the object of his denunciations.

The Commissioners of Sewers of the City of London had before them on Friday last whatever tenders for lighting the main thoroughfares of the City with the electric light their liberal invitation has been able to procure. The general public will have no means of knowing for some time what may be the practical outcome of this action on the part of the City Authorities. The opportunity they have provided for the exhibition of electric lighting on the grandest scale yet witnessed has, we may be sure, been eagerly grasped by more than one of the enterprising Companies which have been formed to extend and develop the various systems of lighting by electricity now before the public. In one respect the magnitude of the experiment to which the Sewers Commissioners stand in a measure committed is a satisfactory feature of it. Apart from the increased solicitude which the carrying out of such a considerable undertaking must bring upon the Commissioners and on those to whom the work is confided, there is the consideration that would-be contractors will be deterred from tendering at unprofitably low prices with ulterior objects, because the scheme is too vast to be used as an advertisement. This reflection is not without comfort to those who do not regard the new luminary with any favour, and who know where one of its weaknesses lies. Another weak point, which we presume the professional advisers of the Commission will not overlook, is generally to be found in what its friends think the strongest recommendation of the light—its illuminating power. With most electric lamps the light they are supposed to be capable of affording needs to be calculated on the same basis as the amount of sulphur impurities in gas; the average of three days should be taken, or, according to some witnesses, the maximum of any indeterminate period is more likely to be the advertised figure. We shall wait with much curiosity the report of the Sewers Committee on the proposals submitted to them. Whatever action they take will be fruitful of interest; while their failure to proceed, should that be the end of their preliminary essay, will be still more instructive.

The annual report and accounts of the Gas Committee of the Nottingham Town Council were presented to the Council at their meeting on Monday, the 6th inst., and were eventually adopted, after a discussion as to the accounts not having been audited by the Borough Auditors, a motion to refer them back to the Committee for this reason being lost. The balance on the profit and loss account in favour of the Committee is

£23,226 14s. 5d., of which £12,500 has been handed over to the Council for general purposes, the sum of £7021 2s. 6d. has been devoted to the extinction of 90 gas annuities, and the balance of £3705 11s. 11d. has been carried to the credit of the reserve and sinking fund. The Committee further recommended a reduction of twopence per thousand feet in the price of gas, and after considerable opposition the Council sanctioned their proposal. The arguments in favour of the reduction were so cogent, and pointed with such force from the past history of the gas undertaking since it has been in the hands of the Corporation, that any other course would have appeared impossible, did we not know the irrationality which so frequently marks the action of corporate bodies. When a Gas Committee happens to be strong, it is seldom that the interests of gas consumers are neglected. It is but natural that members of an administrative Committee entrusted with the management of a concern which brings them prominently before their fellow-townsmen in a twofold capacity, should wish to stand well with their constituents and customers. But with the best intentions they are sometimes defeated by colleagues whose idol is the ratepayer, and in such cases it is difficult to say whether the Gas Committee or their customers outside are the more to be pitied. It is, however, pleasant to be able to record the fact that in one more important town the Chairman of the Gas Committee and his supporters have won a victory in the cause of equitable administration.

The report "On the Best Means for the Development of "Light from Coal Gas of Different Qualities," by Dr. William Wallace, Professor Dittmar, and Mr. John Pattinson, presented to the late meeting of the British Association at Swansea, and printed in the last number of the JOURNAL, is the sole example of matter specially interesting to gas engineers furnished at this gathering. The communication itself is marked with much care and freedom in research, and its conclusions, if not particularly novel, are instructive, and have all the advantage of independent authority; they also bring the comparison of burners down to the present day. The utility of governors in direct connection with every burner is dwelt on very strongly by the authors, and these useful appliances are now so easily obtainable by every gas consumer that their use may be expected to be much extended. The report generally is very readable, and its descriptions and tables are clear and comprehensive. We must confess to a feeling of something like jealousy for the British Association of Gas Managers on seeing work of this nature left to be performed by such an omnivorous organization as the great society in question. There is no reason why special researches of this kind should not be performed by the only body of men in the kingdom who are able to bring any valuable criticism to bear on such statements, or to profit by any improvements in existing apparatus which may be suggested on the study of data so compiled. We had not the British Association specially in view when recommending, as we have repeatedly done, to our own chief technical society, combined action in original research; but that advice is now pointed afresh by the present instance of what ought to be considered little else than trespass.

Quiet progress has marked the last year's history of the Sunderland Gas Company, and the Chairman, at the annual general meeting of the Company held on the 1st inst., found himself with a paucity of interesting topics for his speech. Lack of stirring incidents is, however, not a defect in the report of the Directors of a trading association. Such statements as the Chairman was able to make were highly satisfactory. During the last six years the price of gas in Sunderland has been reduced five times, and another reduction was notified on the present occasion. It was stated that although the last reduction was equal to a loss of £1000 to the Company, as the accounts then stood, the actual diminution in the amount received for gas had been £134 only, in consequence of the elasticity in the rentals following the reduced price. The Company have recently made extensive additions to their manufacturing plant, and there can be no doubt that while the Directors continue to pursue their present policy their business will rapidly increase.

The Wakefield Gas Company, whose half-yearly general meeting was held on the 16th ult., have also found satisfactory results to proceed from a reduction in price. The profit on their half year's working was £6165 19s. 4d., as against £5862 in the corresponding months of last year, or an increase of £303, notwithstanding a reduction representing £750 on the half year's income. The position of the Company is generally good.

The Directors of the Canterbury Gas and Water Company have to report that the profits realized during the past half year enable them to pay the usual dividend to the Shareholders, and to give a bonus to the gas consumers during the two quarters ending the 31st of December next to the extent of fivepence on every thousand feet of gas sold. The reason which induced the Directors to give a bonus, instead of notifying a definite reduction in price, is stated to be their inability to foresee the amount of their future profits. With all deference to any local influences that, although not named in the report, may possibly exist to render the prospects of the Company exceptionally vague, we cannot think the action of the Directors particularly wise. One of the principal objects, as it is a tolerably certain result, of a reduction in the price of gas, is the increase of its consumption; but to secure this result the reduction must be certain, and, as far as may be, unalterable. A constant reliable diminution in cost will naturally do more to give the public confidence, and induce freer use of gas, than spasmodic bounties can possibly effect. In the latter case the whole value of the gift is destroyed by its temporary character; the gratitude of the community has no time to act in the practical shape of enlarged demand, before its exciting cause again disappears. General considerations such as these induce us to form the opinion that the Directors of the Canterbury Gas Company would have done more good to themselves and to the consumers by permanently reducing their selling price by threepence per thousand feet, than by the apparently more liberal course which they have pursued.

The case of conspiracy to defraud the South Metropolitan Gas Company, by tampering with a consumer's wet meter belonging to the Company, which was reported in the JOURNAL of the 31st ult., has been decided at the Surrey Sessions, whither the accused were sent for trial by the Magistrate at the Lambeth Police Court, where the case was originally heard. It will be remembered that the facts of the case, as then alleged, were that the prisoner Joseph Horton, a gas-fitter, offered to save the consumption of gas of Thomas Henry Carman, a licensed victualler, if he had a wet meter. Carman then took Horton to a billiard-room belonging to his son William Thomas Carman, and managed by George Phillips, and in the presence and with the connivance of the younger Carman and Phillips, Horton endeavoured to pierce the drum of the meter, with the object of allowing gas to pass without registration. He only succeeded in piercing the guard, but the meter was, of course, damaged to that extent. All the four persons named were committed for trial, chiefly on the evidence of a labourer who assisted Horton, and who became dissatisfied with his share of the money which Horton received for the job. The defence was that the meter was out of order, and that Horton was called in to put it right, and that there was no intention to defraud. After an hour's deliberation, the jury acquitted Phillips and Carman, jun., and found the other two prisoners guilty, but recommended Carman to mercy, and he was therefore sentenced to three months imprisonment only, Horton being sent to gaol for four months. Thus ends a rare and instructive case, the most satisfactory feature in it being that the design of the prisoners did not succeed, so that the uncertainty attending attempts of this nature, no less than the punishment which follows their discovery, may be expected to exercise a deterrent influence on any evilly-disposed persons who might otherwise be tempted to use similar means for obtaining gas without payment.

The paper on "Coal Seams" read by Mr. Eastwood, of Batley, at the Halifax meeting of the Manchester District Institution of Gas Engineers, is an example of what may be done for the general good by a painstaking observer of things which lie at his own door. The coal so exhaustively examined *in situ* and in the laboratory by Mr. Eastwood is naturally that of the district which supplies his own works; but the observations he makes on the different points that should engage a gas manager's attention in reference to any coal with which he may be supplied, are of wider application. It is not a novel fact that there are different qualities of coal to be found in the same seam; but the magnitude of these differences has not before been so clearly pointed out. Although to some extent the coal consumer is at the mercy of the producer as regards the selection of coal from the seam, a knowledge that the purchaser is fully alive to the tricks of the trade, and constantly examines the material with which he is supplied, or, better still, the desire to maintain the character of his business, should prevent the coal-

owner from sending out the worst product of the seam for gas-making purposes.

Mr. W. Livesey, the Secretary of the Gas and Water Companies Association, has forwarded to all the Companies who are subscribers to the Association, copies of the Employers Liability Act as now passed, accompanied by a note "advising that full acquaintance may be made with its provisions 'before it comes into operation.'" Although we have little sympathy with the losses sustained by those Companies who abstain, and are losers by reason of their abstaining from joining the Association, yet it is our duty to repeat Mr. Livesey's advice to them. The general provisions of the Act will be found explained in detail in another column.

Water and Sanitary Notes.

MR. HENRY ROBINSON, M.I.C.E., having had his attention called to Lieut.-Col. Bolton's remarks on the "occasional cat" and other nuisances connected with open cisterns, proposes the introduction of a law whereby all landlords whose property is in an insanitary condition shall be liable to fine and imprisonment. This would be a critical *régime* for small property owners, whose tenants are often fearfully unmindful of what is requisite for health and decency. Moreover, foul cisterns are not limited to small houses. A West-end club once had a water-cistern in a most outrageous state. Who, in such a case, should be responsible before the law, supposing the house either belonged to the club or were held on lease? Even civic authorities may be defaulters in sanitary matters. We remember having heard not very long since of something being wrong with the water-tank at the Mansion House. The owners of small property are frequently required to rectify sanitary defects in their houses, and are made to obey the law. But when things are put right, the difficulty is to keep them so. Mr. Robinson is doubtless justified in saying that there is "far too much neglect and apathy in matters affecting the sanitary condition of houses, and that the Vestries 'fail to discharge the duty which is imposed on them.'" But the fault of the Vestries would not be remedied by a law which simply threatened a landlord with pains and penalties. The law would still remain inoperative, unless the Vestries bestirred themselves, or unless some more active agency took their place. Mr. Robinson should amend his argument, by showing how his law is to be enforced. Perhaps he means to invoke the police. All would be right if the Vestries did their duty. But they "don't." Logically, Mr. Robinson should propose to put the defaulting Vestries in prison. We acknowledge that this would be what he designates "a drastic remedy." Doubtless a pressure of some kind is wanted in that quarter. The law is good, but the administrator is wanting. So far as the cisterns are concerned, the constant supply will save the occupiers of tenement houses from the peril of poisonous water. But Mr. Robinson reckons that years will elapse before this will be accomplished, whether the work be done by the Water Companies "or by their successors;" and there are other evils besides those which appertain to dirty cisterns.

Responsible public authorities are not always fortunate in their management of water-works. The Dean and Chapter of Ely, and certain ratepayers, have memorialized the Local Government Board on the character of the water supplied to that city by the Local Board of Health. The latter, on being called upon to give an account of their proceedings, have candidly acknowledged that "they cannot defend the present 'character of the water as supplied to the inhabitants,'" but they add that they "have been, and are, engaged in taking 'measures to improve it.'" The measures of improvement appear to be very limited, and the Local Board plead that they should not be urged to any larger outlay until they have discharged the debt incurred some twenty-five years ago for the cost of the original works. The greater part of the burden will be got rid of in five years, and the Local Board desire to see any further expenditure on a large scale postponed until that period. They are also looking forward with apprehension to the operation of the Rivers Pollution Act, by which they will be compelled to withdraw the whole of the town sewage from the river at a great expense, perhaps including the cost of a sewage farm. The Local Government Board, as might be expected, take a somewhat different view of the question from that which is thus expressed by the ruling powers at Ely. The latter are advised that any delay on such grounds as they have put forward "would expose them to very serious responsibility." Whether the Local Board should continue to take their water supply

from the river, or should resort to a deep well in the chalk, is also a question. Finally, the Central Authority calls upon the Local Board to forward plans and estimates for carrying out a suitable scheme of water supply, with an application for power to raise the necessary loan.

While Ely has a supply of bad water, Cardiff has been in danger of having almost none at all. The want of water is said to have been severely felt for some time past in that famous South Wales seaport. Last week the inhabitants were looking out anxiously for rain, which was said to offer "the only remedy." In the meantime, a placard was issued by the Town Clerk, calling upon the people to economize their consumption of water as much as they possibly could. "The necessity of increasing the works," it is said, "is now 'admitted on all hands,'" and the Corporation are expected to buy land for the purpose. Had the water supply still been the property of a Company, perhaps Cardiff would have been less patient, and "all hands" would have seen the necessity of extension a little sooner.

The Lords of the Admiralty, on visiting Portsmouth lately, found occasion to hold a species of conference on the sewage question with the Mayor and the Borough Engineer. Portsmouth disposes of its sewage in such a way as to cause considerable annoyance to the military authorities. To mitigate this evil, the Town Council propose to construct sewage reservoirs, so that the discharge from the outfall may take place at the most suitable time, and yet the inhabitants may not have the drainage of their houses checked. But the site chosen for the reservoirs appears to be unacceptable to the naval authorities, so that between the army and the navy it would seem that the Town Council are in a dilemma. The sewage outfall has already emptied Fort Cumberland of its defenders, and the site for the reservoirs threatens other establishments. The sewage must go somewhere, and we hope the Town Council will soon see what they are to do with it.

Rowley Park, a flourishing and highly respectable suburb of Stafford, is in difficulties about its drainage, and the inhabitants are apparently disposed to regret their past policy of isolation in refusing to be attached to the adjacent borough. It is now proposed to make Rowley Park, together with a neighbouring locality called Dean's Hill, into a special drainage district, under the Stafford Board of Guardians as the Rural Sanitary Authority. It is evidently necessary that somebody should take care of Rowley, for at present the sewage goes into a huge covered tank, which is said to be "seldom, if ever, cleansed." Of course there must be an end to that state of things at some time, and the sooner the better.

A statement has been made public that the health of Dartford is imperilled by the sewerage works now in course of execution, coupled with the drying-up of the wells. The local Medical Officer of Health has disputed the accuracy of the statement, but with an admission that "there has 'been a good deal of diarrhoea, some of the cases being 'of a choleric type.'" Up to Midsummer the mortality from all causes was less than in the corresponding portion of the previous year, but during the last two months the mortality has been nearly double that of the same period last year. While this excess is admitted, as also the prevalence of sickness, the Medical Officer of Health says: "I have no 'reason to suppose that any illness in Dartford has been 'caused by the sewerage works.'"

ACRINGTON GAS AND WATER COMPANY.—The half-yearly general meeting of the Company was held on the 23rd ult.—Mr. S. Rhodes in the chair. The Directors reported that the increase in the share capital of the Company during the past half year amounted to £9633 15s. The expenditure on capital account had been £2658 19s. 1d., principally incurred in connection with the works at Dean reservoir, Great Harwood. They also reported a continued extension and improvement in the demand for both gas and water. There was a gross increase over the corresponding half of last year of upwards of £1000. That increase of revenue would to a great extent enable the Directors to make those necessary replacements and repairs in the purifying department to which their attention was called at the last half-yearly meeting. The Directors were incurring this outlay not only to meet the increasing production at the Ayrington and Oaken-shaw works, but also to supply as pure gas as possible, and this they hoped to accomplish, their policy being to supply good and pure gas at such a price as would encourage and extend its use for both heating and illuminating purposes. The Directors were again making a further reduction in the price of gas, practically bringing the net price to small consumers to 3s. 7d. per 1000 cubic feet, and to large consumers 3s. 4d. per 1000 cubic feet. This reduction they thought would not interfere with the present rate of dividend. The balance of revenue available for dividend after meeting interest and all other demands was £8730 3s. 2d., out of which it was recommended that the usual maximum dividends of 10 and 8 per cent. should be paid, the balance to be carried forward to the current year's accounts. The number of new consumers during the half year was as follows:—Gas, 137; water, 120—total, 257. The report was concurred in, and a dividend in accordance with the recommendation was declared.

THE EMPLOYERS LIABILITY ACT.

THE Employers Liability Bill has at length received the Royal Assent, and is therefore law; the Act will come into operation on Jan. 1, 1881. The vicissitudes of the Bill have so far been numerous, and have left their traces upon it, for the Act as it now stands is not identical with the Bill as it was first introduced; it is less vague, but no clearer. It might be interesting, but it would be unprofitable to trace the origin and object of the more important alterations which the friends of employers and employed have tried to make in the provisions of the Bill since its introduction. Amendments of various kinds, proposing to alter, omit, or add to the few clauses of which the Bill was first composed, and when it was down for discussion filling the parliamentary notice-paper, night after night, with matter many times exceeding in bulk the Bill itself, have met with more or less acceptance, until at last the measure has emerged in the state in which people outside Parliament will have to deal with it. To the very last, when the House of Commons considered the Lords amendments, on the 2nd inst., the differences of opinion still prevailing in the Lower House, with respect to the period, if any, to which the operation of the Act should be limited, were so grave as almost to imperil the passage of the Bill this year; but the difficulty was eventually overcome, and it must have been a great relief to the Government to see the last of one of their most troublesome measures.

As it now stands, the principle of the Act is chiefly contained in the first clause, which provides that if, after the commencement of the Act, personal injury is caused to a workman " (1) by reason of any defect in the ways, works, " machinery, plant, or stock-in-trade connected with, or used " in the business of the employer; or (2) by reason of the " negligence of any person in the service of the employer who " has superintendence entrusted to him; or (3) by reason of " the negligence of any person in the service of the employer " to whose orders or directions the workman at the time of the " injury was bound to conform, and did conform, where such " injury resulted from his having so conformed; or (4) by " reason of the act or omission of any person in the service of " the employer done or made in obedience to the rules or bye- " laws of the employer, or in obedience to particular instructions given by any persons delegated with the authority of " the employer; or (5) by reason of the negligence of any " person in the service of the employer who has charge or " control of any signal, points, locomotive engine, or train " upon a railway—the workman, or, in case the injury results " in death, the legal representatives of the workman, and any " persons entitled in case of death, shall have the same right " of compensation and remedies against the employer, as if " the workman had not been a workman of, nor in the " service of the employer, nor engaged in this work." The provisions of this clause are qualified by the clause which immediately follows it, under the heading of "Exceptions to the Amendment of the Law," and which appears to have for its object the embodiment in some degree of the principle of "common employment," of which so much was heard during the debates on the Bill. By this clause it is laid down that a workman shall not be entitled under the Act to any right of compensation or remedy against the employer, unless the defect that caused the accident arose from, or had not been discovered or remedied owing to the negligence of the employer, or of some person in his service whose duty it was to see that no such defect existed; or unless the injury resulted from some impropriety or defect in the rules, bye-laws, or instructions—special exception being made in favour of bye-laws which have been approved by a Secretary of State. Bye-laws thus authorized are not to be deemed in any case improper or defective. This is a very important exception indeed, as it embraces, as far as can be seen, railways, factories, and workshops under Government inspection, and the like. It still remains to be proved how far this exception can be held to apply, but we may remark that it throws on the State Authorities a greater responsibility than they have hitherto been saddled with. The bye-laws of Railway Companies, for example, in respect of their passenger fares, although sanctioned by the Board of Trade, have repeatedly been upset by the Courts, when they have been found in conflict with the principles of equity, on the ground that no one, whether in conjunction with Government officials or otherwise, can make regulations in defiance of the common right. But here we have similarly-made rules constituted infallible in special terms, and we cannot think the innovation a happy one. Again, if a workman knew of the defect by which he has suffered injury, and failed to report it to his superiors within a reasonable time, he forfeits his rights of compensation, unless he was aware that his employer or his superiors

already knew of the defect or negligence. This provision is a fine opening for dispute in the event of accident, and may be expected to lead to a vast amount of cross-swearing in the trial of a contested claim. As a general rule, it may be said that workmen know more about the state of the machinery, tackle, or scaffolding in connection with which their work is done, than any foreman or inspector, who has to see to many things in different places; and yet the foreman or inspector is commonly supposed to know everything, and the workman will seldom go out of his way to draw his superior's attention to any defect, especially if he thinks himself liable to the suspicion of having caused it in any way, unless the damage is very serious, and cannot well be left to be found out by the foreman on his next round.

The three next clauses refer to the money question. The amount recoverable as compensation under the Act is not to exceed a sum equivalent to the estimated earnings, during the three years preceding the injury, of a person in the same grade, employed during those years in the like employment and in the district in which the injured person works. Moreover, notice of action must be given within six weeks, and the action commenced within six months from the time of death, power being, however, given to the judge to grant an extension of time. The compensation awarded by the Act is to be liable to the deduction of any penalty or portion of a penalty which the injured party may have recovered under any other Act; and no other penalty can be recovered by a workman after he has benefited by this Act. Actions are to be brought in a County Court, but may be removed to a Superior Court. Assessors may be appointed to assist the judge in estimating the amount of compensation.

The next clause refers to the manner of service of notices, &c., and calls for no particular comment; but the clause wherein the definitions of the terms used in the Act are explained is of very great importance. It is laid down that unless the context clearly intends otherwise, the expression *person who has superintendence entrusted to him* means a person whose sole or principal duty is that of superintendence, and who is not ordinarily employed in manual labour. This definition would seem to put a man of the class of unskilled labourers at a disadvantage, as regards ability to obtain compensation, in comparison with a mechanic. There are many men of the former class employed to attend the latter, either singly as "mates" or in gangs, and they are compelled to follow their leader's instructions. In the event of injury it would sometimes be difficult to define the limits of the responsibility of the leading hand. The expression "employer" includes a body of persons corporate or incorporate. The expression "workman" includes railway servants and any person to whom the Employers and Workmen Act of 1875 applies. The prevalence in many industries of piece-work, or more or less formal sub-contracts, also appears likely to cause complications in defining the term "employer." In the erection of engineering works, for example, much of the labour is done by agreement, the sub-contractor getting paid for the amount of work done, but being free to engage or discharge his own men, and to employ as many or as few as he pleases. In such cases the employment of more or less hands frequently makes all the difference between safe and dangerous work; but in case of accident the power of the workman to recover may be useless for want of resources on the part of the employer to meet any demand of the kind. On the other hand, if the immediate employer is to be passed over, where is the right party to be found? The original contract may have been let and sub-let many times over, and it would be no easy matter to distinguish between the various parties concerned in it in different degrees.

The Act, as we have stated, will be in operation from the beginning of next year, and it will then be seen whether its active existence will be less troubled than its period of incubation. Many measures which provoke bitter conflict during their passage into law have been found to sink into oblivion almost as soon as they have been incorporated into the Statute Book, and others which have been as hotly debated in Parliament have subsequently entered into a respectable existence of placid utility, somewhat disappointing perhaps to their sponsors, but not less so to their opponents. We cannot think that the present Act will fall into either of these classes. It is only too probable that the storms which have marked its discussion are but premonitory of yet sterner and more bitter conflicts in the Law Courts, where its powers will be tested; for if there ever was a lawyer's Act, this is one. It may be said of it with even greater truth than is usually contained in the remark, that the judges will have in the first place to make the law which they are supposed to administer. Its provisions are full of

pitfalls, and until these are marked out by the misfortunes of suitors who may be expected to come to grief in them during the next few years, it would be waste of time to seek to anticipate the practical results of the Act. Whether it has been improved or not by the apparently experimental character imparted by its limitation to a period of seven years, is a question it was idle now to discuss. It must be taken for what it is—until it is amended or repealed. The former eventuality is more probable than the latter, as a wide-reaching measure of this kind soon draws round it special social arrangements which cannot well be disturbed.

It is impossible to leave the subject without some reference to the cognate question of insurance, concerning which much loose talk has lately flowed. The common accidents of life are capable of reduction to arithmetical ratios for purposes of insurance, and it will be easy for employers to protect themselves by a special adaptation of the same principle. The effect of the Act on workmen's accident clubs is uncertain; it may possibly tend to destroy much of the feeling of the necessity for provident action on their own part which has led to the formation of these clubs, and if so it will be a very doubtful blessing to the workman. We cannot, however, follow up the various openings for conjecture presented by the secondary action of the new law, as they are endless. For its collateral developments, as for its primary effects, we must wait until time gives us facts instead of hypotheses to deal with.

Notes.

[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

THE RECENT MEETING OF THE BRITISH ASSOCIATION AT SWANSEA.

The meeting of the British Association at Swansea has come and gone. The attendance was small, as compared with former years, 914 tickets of Members and Associates having been sold—being the smallest number since the Hull Meeting in 1862. The meeting is adjourned to York next year under the presidency of Sir John Lubbock, Bart., M.P. Whilst the meeting was small in numbers, it was rich in science, and had lost nothing of its brilliancy, there being amongst their number James Abernethy, C.E., Professor W. Grylls Adams, Professor Allman (retiring President), Professor Ayrton, Sir Henry Barkly, Professor Bayley Balfour, Sir Antonio Brady, Boyd Dawkins, Captain Douglas Galton, Francis Galton, James Glaisher, Lieut.-Col. Godwin Austen, Augustus Vernon Harcourt, Professor Huntington, Dr. J. Gwyn Jeffreys, Baldwin Latham, Lieut.-Gen. Sir J. H. Lefroy, C.B., Dr. Stevenson Macadam, Donald MacAlister, Admiral Ommanney, Captain Bedford Pim, Andrew Crombie Ramsay, LL.D., F.R.S., President Elect; Professor George Rolleston, Dr. Sclater, Professor Seeley, Warrington Smyth, Professor Sollas, Sir Richard Temple, St. George Temple, Sir William Thomson, General Sir H. E. L. Thüillier, Professor Williamson, Lord Aberdare, Howel Gwyn, H. Hussey Vivian, L. D. Dillwyn, Dr. Siemens, and many local celebrities. Many of the papers read were of peculiar local and general interest, Professor Ramsay's opening address, Professor Boyd Dawkins's "Primal Man," and Francis Galton's "Mental Imagery" securing large and enthusiastic audiences. The excursion list to the neighbouring works and places of interest was extensive and varied. Among those which were pronounced the most successful were visits to Dowlais Iron-Works; H.M. Dockyard at Pembroke; Coast of Gower and Bays; Llandilo and various castles; Landore Siemens Steel-Works, Mayam Park; Velindra Water-Works; Ruins of Neath Abbey; and to Mrs. Crawshaw at Langorse, Poole. At all the private excursions the guests were most sympathetically entertained. The excursions were under the direction of Mr. J. Thornton Andrews, C.E., and Mr. Robert Capper, and we are glad to see that the *Times* of the 2nd inst. that a special vote of thanks was awarded these gentlemen for the manner in which they had carried out this portion of the programme. As a further mark of approval, Mr. Andrews was elected to serve on the Committee of "Mechanical Science," Section G. Soirées were held in the Pavilion under the rays of the electric light, the same noise, unsteadiness, and flickering as heretofore characterizing this wonderful illuminant, which had to give way to gas at the later hours. At the Pavilion an exhibition of local manufactures, machinery, and scientific apparatus, had been collected; noticeable were the products from the Landore Siemens Steel-Works, Vivian's Copper-Works, Morfa Copper-Works, &c. At the concluding meeting, at the Music Hall, votes of thanks were passed to the local officers, and the Secretary, Dr. Sclater, alluded to the great hospitality which had been extended by the people of Swansea to the visitors.

THE WORLD'S PRODUCTION OF IRON.

From statements made at the late meeting of the Iron and Steel Institute in Germany, it appears that the average yearly output of pig iron of the whole world is about 15 million tons. Of this enormous total Great Britain supplies about $6\frac{1}{2}$ million tons; the United States yields over 2 million tons; Germany produces $1\frac{1}{2}$ millions; France about equals the production of Germany; Belgium makes

500,000 tons, and none of the other European States reaches an annual production of 1 million tons. The United Kingdom, therefore, still produces more than three times as much pig iron as the United States, the next in order among the nations, but the ratio of the two countries to each other and to the total output has altered within the last 30 years. In 1850 Great Britain produced half the iron used in the world, and the United States about an eighth part; at the present time the home production does not reach half of the world's consumption, and the United States, having quadrupled its output in the same time, now yields one-seventh of the total. At the same time the home production has really trebled within the past 30 years, so that we still hold our own as to comparative progress; but as other nations are also progressing, the iron produced here becomes less important to our neighbours every year. To quote from the *Sheffield and Rotherham Independent*, from which the above statistics are taken, "it is evident that we shall have to continue cheapening the cost of production and searching for new customers if we are to maintain, not to say increase, our trade."

PHOTOMETRY BY POLARIZATION.

In a recent number of the *Journal de Physique*, M. Crova recommends the use of M. Prazmowski's polarizer for photometric purposes. This is a peculiar kind of Nicol prism, having faces normal to the axis of the prism, the two halves of which are joined with linseed oil. It requires for its construction large pieces of spar, and the joint is not easily made, but the arrangement possesses several advantages. The layer of oil, unlike Canada balsam, causes very little loss of light, having an index of 1.485, or nearly the same as the extraordinary index of spar. The polarized field is limited, as in an ordinary Nicol's prism, by a red band on one side, where the total reflection of the ordinary ray commences; but the second limit, corresponding to total reflection of the extraordinary ray, is thrown out of the field of vision; thus the angular value of the polarized field is increased. The increase of field, the angular separation of the only coloured band, and the direction of its bases, normal to the axis, are valuable qualities in some cases. The positive value of polarization as a means of measuring the power of artificial light is still hypothetical, but mainly, perhaps, in consequence of the non-existence of suitable instruments for the application to practical purposes of a law concerning which too little is known that is useful, but a great deal that is as yet only curious.

AMERICAN PUMPING-ENGINES.

In the class of steam-pumps known as combined or direct acting, characterized by the pump plunger being in the same line as the piston-rod, and connected, or rather identical with it, an important improvement is claimed by Mr. Henry R. Worthington, of New York. The Worthington pump, in its latest and best form, has two steam cylinders and two pumps, which are cast together to form one machine, and the pistons and slide-valves of the two engines are so connected that the right-hand division moves the valve of the left-hand one, and vice versa. No tappet, crank, or other rotary device is employed. As the right-hand piston nearly reaches the end of its stroke, the other starts, thus keeping the water flowing in a constant and unvarying stream. The plungers are thus permitted to halt momentarily, and allow the water-valves to close without slamming. This effectually prevents concussion of the valves, and the consequent jar of the pipes and connections. It is stated that pumping-engines on this model are in use for oil-pipe lines, some of them forcing 1500 barrels of oil per day through 100 miles of pipe, against a pressure of 1500 lbs. per square inch. These figures are on the authority of the *Scientific American* of the 4th inst., whence the data for this note are drawn. The arrangement of this double type of engine allows the use of the ordinary slide-valve, such as is used in common reciprocating engines. Single-cylinder pumps are usually constructed with auxiliary piston valve throws, more or less complicated in detail. One of the Worthington engines in use at the Newark (N.J.) Water-Works has a capacity of 8 million gallons daily.

COAL GAS PRODUCTS IN SOIL.

Herr E. Königs, a German analytical chemist, has made an examination of earth which had become saturated with coal gas, such as is found surrounding old main-pipes. The analyst worked up samples of this earth into a paste acidulated with sulphuric acid, and passed a current of steam into the mixture. He then collected in glass receivers the gases and vapours that were given off. The bulk of the product consisted of naphthaline. Carbolic acid was not found in sensible quantity. The peculiar odour of soil after long contact with gas-pipes, therefore, appears to be due to the naphthaline which it contains, probably in company with volatile compounds of sulphur and carbon; but the latter are not present in any notable quantity. It does not appear, from the analyst's notes, that he made any separate examination of similar soil unimpregnated with gas, and, consequently, the exact nature of the changes, if any, due to the continued action of gas on earth was in this case left undetermined.

EAST ADBURY GAS COMPANY.—The half-yearly general meeting of this Company was held on Monday, the 29th ult.—Mr. G. V. Ellerton in the chair. The Secretary (Mr. Banks) read the Directors' report for the half year ended June 30 last, from which it appeared that the business for that period had resulted in a profit of £128 10s. 10d., which enabled the Directors to recommend a dividend of 4 per cent. per annum on the old shares, and on all the new shares on which the second call had been paid. The Secretary read the statement of accounts, which showed that the income had been £490 8s. 8d. for the past six months. The Chairman moved the adoption of the report and accounts, and Mr. H. Waterhouse having seconded the motion, it was carried. The usual votes of thanks to the Directors and Chairman closed the proceedings.

Communicated Article.

ON THE AMOUNT OF LIGHT NAPHTHA IN COAL TAR, AND ITS PRACTICAL ILLUMINATIVE VALUE TO THE GAS MANUFACTURER.

By Mr. H. LEICESTER GREVILLE, F.C.S., &c.,
Chemist to the Commercial Gas Company.

(Continued from p. 335.)

In my last article on this subject, a table was given showing the respective quantities of naphtha found in various samples of tar, taken from different portions of gas-works. The mean amount of light naphtha found in ordinary stock tar was, it will be remembered, 2.6 per cent. by volume. Now, if it is assumed that each ton of coal distilled yields 10 gallons of tar and 10,000 cubic feet of gas, the absolute quantity of light naphtha which is available for transfer to the gas can be easily calculated. I have taken round numbers in expressing the respective yields of tar and gas, in order to facilitate the calculation, the assumed figures being sufficiently near the truth for the purpose in view. Now 2.6 per cent. by volume of naphtha on 10 gallons represents a bulk equal to that which would be occupied by 18,200 grains of water, which amount represents the quantity to be distributed over 10,000 cubic feet of gas. The amount of available naphtha per 100 cubic feet is therefore 182 grains measure, or 1.82 grains measure per cubic foot. The equivalent of this quantity in weight is 1.65 grains.

Having ascertained the absolute quantity of light naphtha capable of transfer from the tar to the gas, the next point to determine was the amount of increased light to be derived from the addition of the naphtha in the quantity stated. The following table shows the results obtained in some experiments in this branch of the subject:—

Number of Experiment.	1	2	3	4
Initial lighting power of gas	16.33	16.60	15.8	15.8
Naphtha added, grains per cubic foot	2.66	2.56	2.7	2.64
Lighting power of gas after addition of naphtha	17.96	18.00	17.1	17.2
Increased lighting power in candles due to addition of naphtha	1.53	1.40	1.3	1.4

Mean quantity of light naphtha in grains weight required

to raise the lighting power of the gas by 1 candle 9.4

Mean quantity of grains to each cubic foot, $9.4 \div 5 = 1.88$

From the above figures can be calculated the equivalent lighting value of 120 grains of light naphtha as compared with sperm. As 9.4 grains of light naphtha were found to afford the light of 1 candle, 120 grains would be equal to 12.7 candles. This result is not widely different to the value assigned by Dr. Knublauch to pure benzole; it will be remembered that this value was 14.15 candles. I may state that the burner used in my experiments was the ordinary standard—viz., Sugg's "London" Argand—and that the method I used for impregnating the gas with the light naphtha was by passing it through a small two-necked bottle placed immediately under the burner. I at first experienced the same difficulty as Dr. Knublauch—viz., that the gas absorbed too large an amount of light naphtha to be subsequently burnt at the rate of 5 feet an hour. I therefore contrived a special apparatus for the purpose of limiting the quantity of light naphtha taken up by the gas, which may be briefly described as follows:—I procured a small bottle of blown glass, having an ordinary neck at the top and an outlet in the form of a tube blown

into the side of the bottle, and extending in a horizontal direction, as shown in the annexed engraving. The neck of the bottle was fitted with a caoutchouc stopper, through which was passed a glass tube, the lower extremity of which was curved and drawn out so as to form a sort of nozzle. The curved part of the tube was turned so that the nozzle was brought opposite and near to the horizontal outlet. By this arrangement the gas flowing in a jet from the glass nozzle had a tendency to escape at once by the horizontal outlet, simply drawing with it a small quantity of the naphthalized atmosphere in the bottle. I found that with this apparatus I could easily limit the amount of naphtha absorbed by the gas to about 2.5 grains to the cubic foot. If it is desired to impart a larger quantity of naphtha to the gas, it is only necessary to lower the inlet-tube so that the nozzle discharges its jet of gas less in a line with the exit-pipe; the gas then has an increased tendency to mix with the atmosphere of the bottle before flowing away, and an increased naphthalization is the result. The apparatus worked well, and with a little care could be easily managed.

With regard to the lighting power which I have obtained from light naphtha, I think the figures may be taken as representing the highest obtainable illuminating value with ordinary gas consumed in the standard burner. My reason for forming this opinion is that

with a liquid like naphtha, which consists of a mixture of hydrocarbons of different boiling points, those which possessed the lowest boiling points (benzole, &c.) would be the first to evaporate. It follows, therefore, that any experiments made by carburetting gas by light naphtha, by the simple evaporation of that liquid at the ordinary temperature, are practically equivalent to carburetting with benzole, and do not fairly represent the lighting value which would be obtained from the bulk of the naphtha. I endeavoured to ascertain the real lighting value of the naphtha by the direct addition of the liquid to gas in a holder, but the results varied disproportionately with varying quantities of naphtha, and were altogether unsatisfactory. This might arise from two causes—viz., the imperfect volatilization of the liquid in the holder, or the partial removal of naphtha during the subsequent passage of the gas to the burner, by the combined action of the friction of the pipes and the contact with water in the meter. The results were invariably lower than those obtained where the naphtha was added to the gas close to the point of consumption.

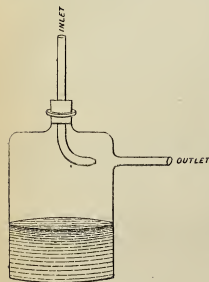
Taking the lighting value which my experiments, under the most favourable conditions, may assign to the light naphtha, it was found that an addition of 1.88 grains to the cubic foot of gas produced an increase of illuminating power equal to one candle. As the available quantity of light naphtha derivable from the tar was in the proportion of 1.65 grains to each cubic foot of gas, it will be seen that this amount represents a little less than a candle of increased lighting power.

As the results which have been obtained in practice wherever the Aitken and Young process has been submitted to a fair trial differ materially from those indicated by my experiments, I think there is but one conclusion to form in order to reconcile that which at first sight appears so discrepant. The conclusion is this, that the large increase in the lighting power of the gas which is obtained by the use of the Aitken and Young process is not directly due to the retention of the light naphthas, but is due to naphthaline which is retained in the gas, being prevented from separating out in the solid crystalline form by the increased amount of naphtha vapour which is present. To account for the large increase in lighting power obtained by the use of the analyzer, I think it is not only necessary to assume that the naphthaline which would be normally present in the gas is permanently retained, but that the gas becomes charged with an increased quantity in its passage through the analyzer, this increased amount being also retained permanently.

I am unable to state what amount of naphthaline is capable of retention in gas at ordinary temperatures by reason of the presence of a definite quantity of naphtha vapour. The experimental determination of such a question would be extremely difficult, but this much is known—viz., that naphthaline is a most valuable illuminating constituent of coal gas.

With regard to the actual lighting value of naphthaline, I made some experiments some time back with the Albo-Carbon light, from which some information may be derived. I may state briefly that the experiments consisted in burning gas, the lighting power of which was known, from a No. 1 Bray's fishtail, attached to an apparatus by which the gas became highly charged with naphthaline vapour. It was necessary to use a burner with small holes, on account of the richness of the gas. The initial lighting power of the gas with the standard burner was 15 candles, and the lighting power with the naphthalizing apparatus was 24.7 candles, with a gas consumption of 3.3 feet per hour, the consumption of naphthaline being at the rate of 103.8 grains per hour. As the initial lighting value of the gas was 15 candles, 5 feet consumption, the lighting power of 3.3 feet would be 9.9 candles. This gives 14.8 candles increase for a consumption of 103.8 grains of naphthaline, or 7 grains per candle. The light value of 120 grains of naphthaline would thus be 17.1 candles. This experiment does not admit of strict comparison with those made with the light naphtha, inasmuch as the burner used in the naphthaline test was not the same as that used to determine the initial value of the gas; at the same time the burner used for the naphthalized gas was, no doubt, well fitted to develop the lighting power from gas of such high illuminating value.

That the use of the Aitken and Young process tends to retain naphthaline in the gas is shown by the letter from Mr. Bell, which appeared in the JOURNAL for Sept. 9, 1879, and that gentleman also testifies to the increase of lighting power obtained by the use of the analyzer, as well as to the increase in the make of gas per ton of coal. With regard to Mr. Bell's figures, however, I quite concur in the remarks made by Mr. Patterson in the last of a series of able articles on "The Effects of the Contact of Tar with Coal Gas," published some time back in the JOURNAL. Mr. Patterson says that inasmuch as Mr. Bell introduced an exhaustor about the same time that he adopted the Aitken and Young process, it is impossible to say what proportion of the improved results which he obtained were due to the exhaustor, and what proportion to the analyzer. More definite testimony as to the effects of the analyzer on the quality and quantity of the gas obtained per ton of coal is to be found in the results of the experiments made by the West of Scotland Association of Gas Managers. Taking a mean of their experiments, the lighting power of the gas was increased by 5.27 candles, the amount of light naphtha transferred to the gas being represented by 2 per cent. on the tar. The increase in the make of gas was in one case 90 cubic feet per ton of coal. What amount of tar was produced from each ton of the coal used is not given; but if taken at 12 gallons, the actual quantity of light naphtha transferred to the gas may be taken at 16,800 grains measure, and as the make amounted to 8634 cubic feet, the proportion of naphtha to each cubic foot of gas was 1.94 grains. As this produced a gain of 5.27 candles, it is obvious that if a *pro rata* argument can be taken the practical value of the 1.82 grains of light



naphtha per cubic foot which I have shown as the available quantity, at ordinary London gas-works, should be no less than 4-9 candles—a very considerable amount.

I will conclude with a few general remarks on the separation of tar from gas. If it is admitted that it is desirable to retain all the available light hydrocarbons in the gas, it seems by no means an economical plan to use such means of separating the tar, that a large proportion of light hydrocarbons are also separated at the same time, involving the subsequent treatment of the tar to effect their return to the gas. It is gradually becoming recognized that cooling is not the only agency by which tar can be separated from crude gas; but, on the contrary, cooling alone is not altogether efficient. I look upon it as quite within the bounds of possibility that by the employment of large vessels in which the reduced velocity of the gas would allow time for the heavier particles of tar to settle, and by the subsequent use of some system of straining through a series of sieves of coarse wire gauze, the tar will be completely separated at the same time that the temperature of the gas will be maintained sufficiently high to permit of the almost complete retention of light hydrocarbons. A similar process has already been recommended by Mr. Aitker, and if any mechanical system could be introduced for the separation of tar on the basis indicated, it would, I believe, be far more perfect than the present method, and altogether more desirable for the purpose of retaining the light hydrocarbons in the gas.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE AMALGAMATION OF THE SOUTH LONDON GAS COMPANIES.

SIR,—The Chairman of the South Metropolitan Gas Company stated, at the meeting of Shareholders held on the 25th ult., that the "B" shares, representing the late Phoenix Company's stock, would for the current half year be entitled to a dividend at the rate of 11½ per cent. per annum, and in effect he also stated that this dividend would, in all probability, be fairly earned. Such a statement must, as you express it in the leading article of your issue of the 31st ult., "strike the Shareholders of the London Company with all the force of a painful contrast;" and, as briefly as I can, I propose in this letter to show what, in round figures, it really means.

The ordinary stock of the London Gas Company on the 31st of December last amounted to £389,900, upon which 1½ per cent. per annum would be £4872 10s. This sum, therefore, is at present annually being lost by the Proprietors, and represents, capitalized at 25 years purchase, a value which, in case of transfer of their property, they would become entitled to receive of £121,812 10s.—sufficiently respectable amounts, both annually and as capitalized, to merit the serious consideration of those immediately concerned.

The only possible defence of the London Board in excusing the policy which has led to this result, and of the inaction which still protracts the period when it may be remedied, is the doubt which may possibly be entertained as to the continuance of the increased dividend with a reduced price of gas. The Board may not consider it necessary thus to defend themselves, but as this is really the eventuality which, in this definite case, is being feared, the probability is worth examination. Assuming that a proposal were made that the London Gas Company's stock should become merged in that of the South Metropolitan, under similar conditions to those of the late Phoenix Company, the first question which would have to be satisfactorily answered would be the possible amount of reduction in the price of gas taken together with the correspondingly enhanced dividend. The reduction in the price of gas would have to be 3d. per 1000 cubic feet to assimilate with the all-round price now ruling in the South Metropolitan district, and the revenue would be affected, as per the quantity of gas sold by meter for the half year ending the 31st of December last, by £8363. The increased dividend on the ordinary stock at its same date would amount to £2436, and the total for the half year would be £10,799.

It is improbable that the Shareholders of the South Metropolitan Company, as now constituted, would consent to amalgamate with the London Company upon terms which would entail a sacrifice upon themselves, and it may therefore be assumed that, under the very best conditions which the London Company could obtain, it would be necessary to be able to show that without such sacrifice a sufficient saving could be effected. Let us examine where this may reasonably be anticipated.

The first reserve to count upon would naturally be the excess profits actually shown for the half year ending the 31st of December last. This apparently amounted to only £2511, but in connection with this sum we have to consider the expenditure which affects such balance. The expenditure of the London Company for the year 1879 is shown, by the analysis of the Metropolitan Gas Companies accounts just published in the JOURNAL, to have been 30s. 11-19d. per ton of coal carbonized, as against 27s. 5-42d. of the South Metropolitan Company; and even allowing these latter expenses to have become slightly increased (which is scarcely probable) by amalgamation with the Phoenix Company, a difference of quite 3s. per ton might still, I think, be calculated upon. This alone would amount to £10,782 for the half year. These items, by themselves, would be more than sufficient to meet the *per contra* already noted; but there are other sources of economy which may at once be counted upon to come into action. Increased consumption of gas would be one of, if not the chief of these, and it is obvious that the district lighted by the London Company will compare favourably in this respect with that of any of the other Metropolitan Companies.

This letter is based upon a possible 1½ per cent. increase of dividend; but it is very evident that, without being over-sanguine, more may be reasonably hoped for. The Governor of the Chartered Company, at the recent meeting of Shareholders, gave a few figures bearing upon this. For instance, he stated that bonds in perpetuity were now saleable at a

saving of ½ per cent. upon former rates, and that, as compared with the corresponding period of 1879, the tar had realized a much higher price per gallon. The first of these items would effect a saving on the loan capital account of the London Company, and the latter would represent increased revenue to the extent of several thousand pounds per annum. In the full manufacture of the tar and ammonia products, however, there is a great future of increased revenue for all large gas companies, and taking this prospect in combination with probable economies in the direct manufacture, it would be somewhat bold to predict exactly the minimum to which, with corresponding increase of profits, the price of gas may be reduced; but I think I have said enough to show that no reasonable fears need be entertained as to an 11½ per cent. dividend being possible to the Shareholders of the London Company, should amalgamation upon fair terms with the South Metropolitan Company be effected.

Sept. 9, 1880.

VIGILANS.

MR. METHVEN'S LIGHT UNIT.

SIR,—In the last number of the JOURNAL there appeared a summary of the proceedings at the meeting of the Gorman Association of Gas and Water Works Engineers, in which summary it is stated that the Photometric Committee of the Association, with Dr. Rüdorff in concurrence, reported adversely to Methven's unit or standard photometric light, in the following terms:—"The Methven unit is more liable to variation than the candle, so that nothing would be gained by its adoption."

With all possible respect to the Photometric Committee, and to Dr. Rüdorff as its head, I must in positive terms deny the correctness of the conclusion arrived at, even if spent upon the most trustworthy of those which we can obtain in England were used in the comparative experiments. I trust I am not disposed to be dogmatic in matters of science, as I generally submit myself respectfully to its professors; but in the matter of practical photometry I think the experience of nearly thirty years devoted to its theory and practice entitle my results to an exhaustive examination by the most skillful scientific photometrists before they are negatived or set aside. Such examination I invite from the German Association.

I have made many hundreds of experiments with the Methven standard, all of which were conducted with the utmost possible care and precision. I am now engaged upon another series, the results of which, when completed, I hope presently to publish. All my experiments show conclusively that the value of the "standard" to an investigator is immense; for comparative experiments, which with candles would demand an hour's time and work, can with the "standard" be readily completed within a few minutes, and with a concordance in results which is alike satisfactory and delightful. It affords me much pleasure to say that Mr. Greville Williams, F.R.S., who has had great experience with the Methven standard, has repeatedly expressed to me his gratification at the extreme regularity of the results which he has obtained with it.

I shall send a copy of this letter to the Secretary of the Gorman Association, accompanied by an offer to present them with a Methven standard on condition that it shall be tried in accordance with my printed instructions, and a report of the results which may be obtained be furnished to me. If any member of the Association should happen to be in England, it will afford me the greatest pleasure to give him an experimental proof of the rigorous accuracy of all my assertions respecting the instrument.

55, Milbroke Street, S.W., Sept. 9, 1880.

F. W. HARTLEY.

BROMLEY GAS CONSUMERS COMPANY.—The half-yearly general meeting of this Company was held on the 24th ult.—Mr. B. Latimer in the chair. The Directors' report, which was read, stated that the Company's business had become almost stationary during the last half year, the total increase being only 1 million cubic feet, or about 2½ per cent., instead of the previous average rate of about 14 per cent. The balance of the profit and loss account, available for dividend, was £3221 2s. 5d., which would not allow any dividend to be declared on the two classes of shares, and the Directors recommended that the dividend should be at the rate of 9 per cent. per annum on the ordinary 10 per cent. shares, and 6½ per cent. per annum on the ordinary 7 per cent. shares. This would leave about £160 to be carried forward to the next half-yearly account. Nearly £400 of capital had been expended during the past half year in enlarging mains and completing the works, and with the exception of the railway siding, the Directors did not anticipate any very heavy further outlay. The report was unanimously agreed to.

BERYSSO WATER COMPANY.—The twenty-second annual general meeting of this Company was held on the 27th ult., when the Directors' report and the accounts of the Company for the year ending June 30 last were presented. The former stated that the domestic rates for water showed an increase of £32 on those of the previous year. There had been 178 additional houses connected to the Company's mains, making the total number 2006. The previous working expenses, and the interim dividend of 5 per cent. per annum for the half year ending December last, there remained a balance of £778. The Directors recommended the declaration of a dividend for the second half year of 6 per cent. per annum, carrying forward £178. The Company's capital, share and loan, is £21,500, the whole of which, with the exception of a small balance, has been expended. The revenue account showed receipts to the amount of £2019, against £1624 in the year ending June, 1879; the expenditure being £684 this year against £622 last. The balance carried to net revenue account in 1879 was £1002; this year it is £1334, being an increase of £332.

MARLBOROUGH WATERWORKS COMPANY.—The annual general meeting of the above Company was held on Tuesday, the 31st ult.—Mr. W. Roper in the chair. The Directors' report, which was taken as read, stated that the net profit for the year amounted to £918 11s. 2d., which, with the balance from last year, £898 12s. 10d., made a total of £1802 4s. available for dividend. This enabled the Directors to recommend a dividend of 4½ per cent., free of income-tax, for the year. £474 of which was paid on the 1st of March last, and to carry forward a sum of £373 19s. 2d. to next year's account. At the commencement of the year a reduction of 5d. per 1000 cubic feet was made in the price of gas, the charge being 6s. per 1000 cubic feet. The Chairman, in moving the adoption of the report, said the Company had not had as successful a year as the Directors could have wished; they had, however, better materials, and were likely in the future to effect a great saving in the manufacture of gas. The report was adopted, and the thanks of the meeting having been accorded to the Directors and Manager, the proceedings terminated.

Miscellaneous News.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

(Concluded from p. 392.)

Mr. C. EASTWOOD (Batley) read the following paper on

COAL SEAMS: THEIR STRATIFICATION; AND THE GAS-PRODUCING QUALITIES OF THEIR DIFFERENT SECTIONS.

The mining engineer has proved the existence of many individual seams of coal; the chemist and geologist conjointly have endeavoured to explain when, where, how, and of what they have been formed; and the geologist has shown that the nature of the soil and the nature of the gas-producing qualities, and consequent value to him. I wish to-day to show you that the coal in many of those individual seams exists in a stratified condition; that it consists of horizontal layers or sections in the line of the stratification; and that each of those layers or sections varies, almost uniformly, in the quantity and quality of the gas produced from them. In order that you may at once perceive more fully the object, nature, and extent of my investigations and experiments, I will explain the circumstances which led to them.

Prior to 1877 I had been accustomed to determine by a laboratory analysis the relative values of the various coals offered to me, and had been frequently surprised at the different results obtained at different times from the same seam of coal, quite as much as some of the critics amongst ourselves are surprised at the different results obtained by various experts from the same seam of coal; and was just as unable as they to give a satisfactory explanation of the circumstance. But I knew had confidence in the honesty of their statement; I sought neither to flatter nor to favour any one, because up to the present moment, with one exception, I have not given any contractor the result of any experiments, and that exception was in vindication of my action in countermanding a contract which had been entered into from reports which were not afterwards substantiated by my own experiments, &c. My experiments, you will thus see, were made for my own information, and I knew that, however much the results might vary, they represented the value of each sample of coal, plus any imperfections or variations in the method of conducting the respective analyses. Yet such were their variations, which at times I thought were of small quantity of coal used (26 lbs.), and to the more or less fairness in selecting it, that I determined to submit the whole of the coal offered to me to a working analysis of not less than 24 hours duration, in order that I might not only obtain data upon which to estimate their respective values, but also that I might approximately estimate the quantity of gas that should be produced per cubic foot of coal carbonized each week, from the known quantity of each class of coal used. For this purpose I had every part of the apparatus carefully examined, and the purifiers so charged that there might be no changing of them during the experiments, which were made during the summer-time with coal specially supplied for the purpose.

My intention was here to have been to have my office it to say that, guided by them, we made our purchases and all went on well up to the commencement of the winter season, when my make of gas per ton gradually decreased each week. I, of course, blamed the men, and charged the foreman to see that everything was properly attended to, but without any improvement. I therefore gave the subject my personal attention, and spent almost day and night in the retort-house; but, beyond rectifying some slight defects and finding out a few other long standing, but for the time being irremediable ones, I made no satisfactory improvement. I had, however, observed certain peculiarities in the character of some of the coals delivered thus constantly before me, which induced me to re-test them. This I did in such a manner that the coal contractors were not aware of what I was doing. The result showed that whilst one sample exceeded the standard and another came fairly up to it, others fell far below it, in one instance of 1620, another 770, and another 755 cubic feet per ton. The latter were from local pits, and I had thus a perfect opportunity for watching the character of coal delivered daily; and such was the nature of the observations, that I made an unexpected visit to one of the contractors pits, where I beheld a somewhat Darwinian system of "the selection of the fittest" in full operation; for the coal was being sent out to the workings more or less selected, and a certain quantity was reserved for the retort-house. The coal was loaded in household purposes. I also noticed that although they sometimes put some of the gas coal amongst the house coal, they did not put any of the house coal amongst the gas coal; and when I asked the banksmen why they did not do so, he informed me that anything was good enough for gas coal. I thus saw at least one of the reasons why the gas coal was so much better than the house coal; but before making any formal complaint, I wished to inspect the seam of coal as it lay undisturbed in its natural bed. This I did, in company with the manager of the pit, and spent many hours looking through the extensive workings. I saw that the seam presented three separate and distinct sections or classes of coal in the line of its stratification; and also the facility with which in its fall the upper section—about 1 foot thick—split freely off from the remainder, which was about 16 inches thick. The upper section was picked up by the men and sent out separately, and corresponded with the kind of coal I had previously seen loaded for household purposes. The lower section was left in the retort-house, and a little extra for this selection. The remainder of the coal was then gathered up and sent out, either for gas or engine coal. If for gas coal it was riddled; if as engine coal it was not screened. It now only remained for me to have samples of each section supplied, in order that I might make comparative tests to see to what extent the results of experiments.

Before proceeding to give you the results of experiments, I think it necessary to inform you that in all my laboratory analyses the weight of coal used was 56 lbs. The ascension-pipe had 1-inch dip; but the weight of the gasholder, having a capacity of 400 cubic feet, gave a pressure of 14 inches upon the retort. The gas was cooled by passing upwards through a 2-inch worm condenser into a settling chamber, and was purified with oxide of iron only to enable me to make volumetric analyses of the impurities not removed by the oxide. The illuminating power was ascertained with one Suggs and Evans's photometers.

The following are the results of the laboratory analyses of some selected samples, to show the different results obtained from the sections into which the Haigh Moor seam is divided in the line of its stratification:—

	Top.	Middle.	Bottom.
Weight of coal analyzed, lbs.	56	56	56
Gas made per ton of coal, cubic feet	10,449	9,620	9,599
Illuminating power, standard candles	16.83	16.49	15.36
Value of coal per ton, lbs. of sperm	613	538	508

The results, corroborated by many subsequent experiments, proved the superiority of the upper section of the Haigh Moor coal; and I cannot but think the opinion previously formed respecting the cause of the discrepancy between past and present results. The former were obtained from a sample of coal sent during the summer time, when there was little demand for house coal; the latter were obtained from a sample unexpectedly taken from the winter season, when there was a demand for house coal; in consequence of which the upper section was not sent for gas coal.

Guided by this experience, I extended my inquiries into the character of every seam of coal from which I then, or have since, obtained my supply, with the following results:—

	Weight analyzed.	Gas made per Ton.	Illuminating Power.	Value of Coal per Ton.
	lbs.	Cubic Feet.	Standard Candles.	lbs. of Sperm.
Little Middleton Seam	Top. 56	11,920	14.75	602.81
" " " " " " " " " " " "	Middle. 56	11,300	16.37	628.68
" " " " " " " " " " " "	Bottom. 56	9,000	17.17	522.91
Middleton Main Seam	Top. 56	12,140	16.10	670.10
" " " " " " " " " " " "	Middle. 56	11,840	16.21	641.90
" " " " " " " " " " " "	Bottom. Only sent	out as engine coal.		
Middletown Main Seam	Top. 56	11,920	15.97	663.00
" " " " " " " " " " " "	Middle. 56	10,660	17.88	619.00
Middletown Main Seam	Top. 56	10,660	18.35	679.40
" " " " " " " " " " " "	Middle. 56	11,840*	16.54	671.45
" " " " " " " " " " " "	Bottom. Not got, because of the depth of the parting.			
Flockton Seam	Top. Not got, because of the depth of the parting.			
" " " " " " " " " " " "	Middle. 56	11,820	15.64	604.86
" " " " " " " " " " " "	Bottom. 56	9,400	17.16	533.94
Flockton Seam	Top. Not got, because of the depth of the parting.			
" " " " " " " " " " " "	Middle. 56	11,440	14.90	549.00
" " " " " " " " " " " "	Bottom. 56	9,920	13.50	459.00
Haigh Moor Seam	Middle. 56	11,840	13.31	540.30
" " " " " " " " " " " "	Bottom. 56	10,600	13.30	492.48
Admaltan Black Bed Seam*	Top. 56	12,200	15.37	642.90
" " " " " " " " " " " "	Middle and Bottom. 56	9,800	15.57	523.15
Brown Metal Seam*	Top. 56	10,600	15.71	576.90
" " " " " " " " " " " "	Middle and Bottom. 56	9,360	16.40	526.30

* This is the only instance where I have found the middle section yielding a larger quantity of gas than the upper. This is entirely due to the excessive amount of hard-band coal found in the upper section, and which is hereafter referred to.

+ Additional particulars: Weight of coke per ton of coal—tops, 1660 lbs.; middles and bottoms, 1440 lbs. Weight of tar and liquor per ton of coal—tops, 340 lbs.; middles and bottoms, 290.

+ Additional particulars: Weight of coke per ton of coal—tops, 1420 lbs.; middles and bottoms, 1200 lbs. Weight of tar and liquor per ton of coal—tops, 340 lbs.; middles and bottoms, 320 lbs. Sulphur per 100 cubic feet "Harcourt's test"—tops, 46 grains; middles and bottoms, 92 grains.

The following are laboratory analyses of the Black Bed seam of coal, as supplied from Conyer's Colliery at Dewsbury Moor, showing the results obtained at different periods from this seam, which clearly show the before-mentioned distinctive stratifications and sections clearly defined:—

Date of Analysis.	Borrowed Analysis.	1875. June 26.	1876. July 11.	1877. June 21.	1878. March 25.	1880. Feb. 5.
Weight of coal analyzed, lbs.	Not stated.	56	56	56	56	56
Gas made per ton of coal, cubic feet.		12,300	11,803	10,600	11,730	11,280
Illuminating power, standard candles.		15.47	16.40	15.75	17.15	16.84
Value of coal per ton in lbs. of sperm.		684.21	663.49	572.40	672.04	607.71

Note.—I frequently find in this seam a band of canal varying in thickness from 1 to 4 inches, but it is not uniformly present.

These experiments, frequently corroborated by subsequent ones, uniformly prove that these horizontal sections uniformly vary in the quantity and quality of the gas produced from them; showing that the results obtained in my former experiments with the different sections of the Haigh Moor seam, were somewhat similar to those obtained from five other individual seams, and that the Haigh Moor seam was not isolated in its peculiarities.

The Haigh Moor seam crops out at Batley, and dips towards the south-east in the direction of Wakefield, where it attains a depth of over 400 feet, and varies in quality with its depth from the surface. The partings between the sections are quite distinct, and notwithstanding the existence of numerous faults, they, as well as the thickness and character of the sections, are uniform throughout. The upper section is more compact and cohesive than the middle, and the middle much more so than the lower. From this circumstance—which influences the size of the cubes when the coal from each section is broken—each section may be recognized on the pit bank. It is chiefly because of this that the upper section of almost every seam is selected for household purposes, and from the facility with which it is separated by the parting, and the cohesiveness of the coal, this is easily done. The partings vary in their composition in various seams, but are quite distinct from the thin deposit of mineral charcoal present in almost every piece of black coal. These are chiefly of a clayey composition, and have frequent deposits of mineral impurities.

Respecting the Flockton seam, I may observe that the outcrop is at Batley with a south-easterly dip. At Batley and Dewsbury the upper section is separated from the lower ones by a stratum of strong mud, varying in thickness in the direction of the dip, with a fairly continuous band of ironstone about 2 inches thick. When inspecting this seam at the Riddings Colliery at Dewsbury, I had the advantage of passing along the main road for about 14 miles in the direction of the dip, and noticing the contour of this intervening stratum—which at the outcrop was thin, but increased in thickness with the distance. I was struck by the fact that the lower sections had been formed in a slowly sloping valley or basin, which had been subsequently filled with water, thus forming an inland lake, into which the clay and sand of neighbouring hills have been carried by streams and deposited, thus filling up the lake and leaving a level surface, upon which the upper section had been formed. Throughout this section or stratum of strong mud no marine fossils are found, indicating its fresh-water formation; but in the roof, above the upper section, there is an abundance of marine fossils. In consequence of this deep parting, the upper section is not obtainable, and I have been unable to get samples even for analysis.

Respecting the lower sections of the seam, I may state that here the partings are thin and frequently indistinct, until the coal is being "wedged off," when it is seen to be continuous. I had no difficulty in finding the parting, where it was thin, with the aid of a crooked instrument similar to that made use of to remove the wire from the corks of soda-water bottles. The substance extracted was clayey, and when moistened was plastic, the thinness of the parting being probably due to

erosion. The character of the seam of coal at Batley and Dewsbury is very different in its cohesion. Between the two places there is a great fault; and at Batley, in consequence of the nature of the roof and its depth from the surface, the coal after a storm of rain is as wet as if dipped in the sea. I have in consequence had frequently to suspend the delivery of coal; but when it is obtained dry it is a good coal.

The Middleton Main and the Middleton Little seam, although varying considerably in different districts in its quality, and the nature and depth of its partings, in consequence of numerous faults, presents as clear an illustration of this distinct stratification in our coal seams. Like the Haigh Moor there is no mistaking them. The bottom section wherever found is an inferior coal; and I have already shown you that the Loddow Colliery Company candidly acknowledge the fact, by declining to send it out except as common engine coal. I wish all colliery owners were of the same opinion, and as honestly carried it out in practice.

The middle section I find to be a good gas coal which produces a good coke, and can be and is supplied separately. The upper section is also considerably better. I find in its stratum of hard-band coal, varying in thickness and density. It is hard, compact, and foliated; splitting into longitudinal plates in the line of its stratification. Its cross vertical fracture is splintery and angular. The coal is coarse in the grain, presenting a grey-black, with thin streaks of iron pyrites. When finely powdered and placed under a microscope, it exhibits its earthy composition; it ignites with difficulty; the coke frequently retains the structure of the coal, and requires the draught of a blast furnace for its combustion. A stranger with a piece of this coal in one hand, and Mr. Paterson's "Lithology of Gas Coals" in the other, would be completely deceived.

With the exception of this hard-band coal, made solely on account of the character of its coke, the upper section is a good gas coal, and such is its similarity to the middle section, at the Southill Wood pit, that but for other instances proving otherwise I should have regarded them as being of the same formation. The depth and character of the parting between the middle and the bottom sections of this seam vary considerably; in some instances the parting is thin, and the bottom section is obtained; but at the Southill Wood Colliery it is from 2 ft. 9 in. to 3 ft. thick, and consists of spavin or strong bind, with no marine fossils, and in consequence of this the bottom section is not worked as a circle of seam known by any one using this gas for gas-making. You will see from my analyses that I have found one seam in my neighbourhood which does not present these distinctive sections clearly traced by a parting of shale or strong bind. It has the appearance of being a single formation, differing chiefly in the cohesiveness of the coal from the top downwards. I refer to the Black Bed seam; but its character is not uniform. I have used this coal for six years, and consider it the best that I am acquainted with for making gas and coke. Generally speaking, it breaks up cubically in all directions, presenting clean black velvety surfaces, which, when abraded, exhibit a rich brown shade of colour, and when finely powdered and placed under a microscope it retains its appearance. In examination of the seam at Dewsbury Moor, I found in one part of the pit a kind of cannel, varying in thickness from 1 to 4 inches at the bottom part of the coal; but it is not uniformly present. When it is present, however, the entire seam is not so cohesive as where it is not present. Between the two places there is a slight fault, parallel with the main fault, and this fault changes the character of the coal. Some days the coal I receive contains this cannel, and on other days, and even on the same day, there is no cannel present. This is entirely due to the different parts of working from which the coal is obtained.

From the fact that the cannel appears to be a single formation, and the general friability of the entire seam rendering it difficult to obtain sections, and also because the coal is not suitable for household purposes, I have not made sectional analyses. Yet the analyses I have given you vary. The samples were taken unselected from coal as usually delivered. The variations present themselves in my workings, and are found in the following instances, and are due to the presence of this band of cannel. I will also give you some comparative results from coal from this seam, obtained from pits widely separated from each other, and between which there are numerous faults. These will show the character of the entire seam.

Analyses of Black Bed Seam of Coal.

Date of Analysis.	May, 1878.	June, 1878.	July, 1878.	July, 1879.
Weight of coal analyzed, tons	65	59	62	29
Gas made per ton of coal, cubic feet	9,655	10,271	9,816	10,290
Illuminating power, standard candles	13 10	14 12	13 10	14 12
Value of coal per ton in lbs. of sperm	568 14	607 10	582 90	588 22

Laboratory Analyses, showing the Comparative Results obtained from the Black Bed Seam of Coal, from Different Pits, at Considerable Distances from each other at the same Period.

1877.

	Howden Colliery Company.	Liveridge Colliery Company.	Haighs of Dewsbury Colliery Company.	Mitford Colliery Company.	Broadbent and Johnston.
Weight of coal analyzed, lbs.	56	56	56	56	56
Gas made per ton of coal, cubic feet	12,160	13,680	11,720	11,200	11,460
Illuminating power, standard candles	16 10	18 12	15 12	14 30	15 24
Value of coal per ton in lbs. of sperm	618 70	678 80	672 40	611 30	628 30
Weight of coke per ton of coal, lbs.	1520	1460	1690	1600	1600
For and liquor per ton of coal, lbs.	130	150	850	220	209
Sulphur per 100 cubic feet, per "Harcourt's test," grains.	40	25	26	45	125

I have also found, as shown in the following working experiments that the results obtained from coal supplied in vertical section from different parts of the same seam to vary considerably—the shaft was not deep, though the workings were extensive—partly in consequence of numerous open faults, the proximity to the outcrop, and the action of air and moisture upon its extensive surfaces. The effect of the two latter you will appreciate from your knowledge of the extent to which coal becomes anthracitic when stacked in your yards for any length of time.

Working Analyses, showing the Results obtained from Flocion Coal selected from different Parts of the same Seam, and specially supplied for the purpose.

	No. 1.	No. 2.	No. 3.	No. 4.
Weight of coal analyzed, tons	7	9	10	8
Gas made per ton of coal, cubic feet	11,250	10,506	9,875	8,575
Illuminating power, standard candles	15 12	14 30	14 30	13 26
Value of coal per ton in lbs. of sperm	615 60	580 32	567 10	491 77

I have avoided giving any geological reasons for the different formations of these different sections in a seam of coal as separate and distinct, preferring, for practical purposes, to deal with the unquestionable fact that they are there, however formed. I may state that with this knowledge and these results before me I am unable to agree with a very eminent authority, when he states, in reference to the variation of the quality of the coal itself, that "he ventures to express a doubt whether the discrepancy between the commercial value and practical results is alone due to this cause; and that his experience leads him to the opinion that the alterations in the physical conditions of a seam form one only, and that probably the least important of a series of causes which operate to reduce both quantity and quality of gas on a larger scale." (*See JOURNAL OF GAS LIGHTING*, June 17, 1879.)

My experience leads to a different conclusion. I had, you see, in 1877, long before the publication of that letter, with its attendant correspondence, established the fact that some seams of coal do uniformly present, in the line of their stratification, distinct strata or sections, varying widely in the quantity and quality of the gas produced from them; and that those seams were not accidental, but that physical causes constant and inevitable. This leads me to the conclusion that their existence was the most important of any cause, of the different results obtained both in the laboratory and on a larger scale; and I have given practical effect to that opinion, by inserting the following clause in all my contracts and advertisements for coal since 1877—"On no account will the contractor be permitted to select or reserve the best part of the coal obtained from his pit for household purposes, and deliver the remainder as part of this contract."

Upon this subject I admit of no "ifs" nor "buts"—the facts are clear. I have no per theory to protect, by not using any of them; and if it is a truism that our opinions are made in the refectory, and as so-called a source whence it is derived, too much care cannot be exercised in the selection of it, and obtaining what you pay for.

Permit me now to make a few remarks in reference to the discrepancies which frequently present themselves in the analyses made by different experts from the same seam of coal. I have no occasion to say that evidence has taken place respecting them, but I hope that all our criticisms may be kept within the bounds of that moderation due to gentlemen who generously give us the results of their researches in a subject which admits of no finality. I take it as a *sine qua non*, that they have and can have no other object in view in their communications than to give you of useful information, and the correction of erroneous opinions formed, possibly, from an imperfect acquaintance with the subject. From the experiments narrated in my paper you may see that I am prepared to expect that those differences will present themselves, and I should be surprised if they did not. As the value of the coal may vary, the value of gas coal, showing the different results obtained by different experts from the same seam of coal:—

Siltstone Seam, Barnsley.	No. 1.	No. 2.	No. 3.	No. 4.
Gas made per ton of coal, cubic feet	13,600	12,240	11,250	10,250
Illuminating power, standard candles	15 30	16 06	16 40	17 00
Value of coal per ton in lbs. of sperm	742 00	699 00	632 60	597 30

Black Bed Seam.	No. 1.	No. 2.	No. 3.	No. 4.
Gas made per ton of coal, cubic feet	12,600	12,640	11,584	—
Illuminating power, standard candles	16 07	14 35	15 76	—
Value of coal per ton in lbs. of sperm	720 00	689 17	745 10	—

These comparative statements show great variations, but no greater than I have found and constantly obtain from the same seam of coal. Therefore too much caution cannot be exercised before giving a comparative opinion, and I have endeavored to give you an experienced expert's view, much as they value the good opinion of an expert, but value yet more highly the approval of a good conscience. Without a doubt their results express the value of the particular sample of coal supplied to them, although, from circumstances to which I have referred, their deductions from them, respecting the character of the seam in general, may be unaided observations in their analysis. In their analysis, the efficiency of their apparatus may vary, the skill of the experts may vary, and above and beyond all the sample of coal may—may, must vary. A more thorough knowledge of the seams of coal referred to will tend to modify if not remove these discrepancies which, instead of being the cause of complaint, should be regarded as a warning to the value of these distinctive sections and peculiarities in the seam. They are the light-buoys on the sea of experiment—warning you of dangers ahead.

I may conclude by remarking that faults and failures you may find in my experiments. They were made, most of them, many years ago, not for publication, but for my private information, to clear up a difficulty which had presented itself in the ordinary course of business, and I thought that, under present circumstances, the narration of them might prove interesting to you; for experience has shown that even the record of a failure has proved the stepping-stone to a more important success even in another direction. But I may say, that the value of the stratification of our coal seams with the different sections varying in the quantity and quality of gas produced from them, have added but another to the multitude of obsolete ideas encumbering the paths of Science. I have done what lay in my power briefly and clearly to state the facts presented to me. You may now make your own calculations, and time, the detector of all human error, will prove their correctness.

Discussion.

THE PRESIDENT said he was very pleased that Mr. Eastwood had gone so fully and so thoroughly into this subject. He thought the paper, valuable as it was as it had been read over, would be much more so when it was printed, and the members had it before them, because it was quite impossible to follow a series of elaborate tables, and have a very clear idea of any matter when they were simply read over, and as it was equally difficult for Mr. Eastwood to make them interesting. He thought the members would all agree as to the value of the paper.

MR. CLARKE (Ashton-under-Lyne) was very much pleased with the paper, which he thought had given the members an insight into many things about which they might not have been previously aware. He had frequently been there while working with one class of coal there had been days and days together when the production had been different to what it was at other times, and, as Mr. Eastwood said, he had often gone to the foreman, and persisted that there must be some neglect—either that sufficient water was not used, or some other cause was at work, to cause the difference. He had on such occasions searched the place from end to end, without finding anything to account for the falling-off in the production, and in a day or two things had righted themselves. Mr. Eastwood's paper had clearly shown him that the difficulty must have arisen through the variation in the quality of the coal. He had then said that he was sure he did not exactly understand what Mr. Eastwood meant by "tops," "middles," and "bottoms." Were there three seams of coal?

MR. EASTWOOD: No; they are different sections of the same seam, separ-

rated by distinct partings, which are sometimes an inch, and sometimes as much as five inches thick.

Mr. CLARKE remarked that it there was this wide difference between the "middles" and the "bottoms" of the same seam, a strict test ought to be kept on the coal supplied. He considered the paper a very useful one.

Mr. COLES (Tadmorden) said the reader of the paper spoke about the men not doing their duty, and the necessity of looking after them very carefully. Of course, that was a very important thing. Then as to quality of the coal; the quality stipulated for could not always be delivered in bulk. Mr. Eastwood had told them that, experimenting with 56 lbs. of coal, he found that it yielded at the rate of 11,850 cubic feet of gas to the ton. Would it be pure coal?

Mr. Eastwood said he had stated most distinctly that he had specially selected each sample.

Mr. BRYAN wished to know whether Mr. Eastwood found this great variation in nuts.

Mr. JONES (Chesterfield) said the paper was something out of the usual run of papers which they heard at meetings like this, and he was very pleased indeed that Mr. Eastwood had taken up a subject of so much importance, and handled it in such a workmanlike manner. There could be no doubt that much of the variation in the quality of gas was due to the difference in the quality of coal, and to the fact that the merchants had been in the habit of dividing their coal. He was very glad that a gentleman in the coal profession had turned his attention to the subject, and had succeeded in discovering the cause of much anxiety to gas engineers in general. He was, however, rather surprised to find that "middles" did not come out so well as he had expected. He could quite understand that in the coal formation the *débris* of the forests would be mixed up with the mineral matter of the bed, and that the coal would be inferior at the bottom; but he fully expected to find that "middles" would be better than "tops"—to use Mr. Eastwood's expressive phrases. He had with him a complete sectional drawing of the Yorkshire coal-field, and he looked through it as his friend was talking, but he did not find the part of the paper which he had been looking for. He considered the best gas-producing coal in the Yorkshire field. The section which he had was clearly drawn on a very exact scale, and the foreign matter between the various beds of coal, sometimes dividing them a quarter of an inch and sometimes two or three inches, was distinctly shown. He had had a section of the Derbyshire coal-field, and he might say that he thought a good deal of the information could be elicited from these various sections. The subject of coal was certainly one of the most important that could come under the notice of gas engineers, and a full consideration of it, in relation to its quality and in all its bearings upon the gas industry, certainly could not be done in the time of the paper. Mr. Eastwood had done what he could, and he was not surprised, as he had already said, that coal from the same bed should vary in quality. He had known cases in which coal taken from the same bed, but at points a few yards asunder, had differed very remarkably indeed. He rather took exception to one thing which Mr. Eastwood did. He said he took out 56 lbs. of coal for testing purposes, and if he did not qualify that statement by saying that he took the mean of eight tests, he (Mr. Jones) should have said he considered that a very small quantity. For his own part he liked to take at least half a ton of coal for experiments of this kind. There were many collieries where the entire seam was worked, and such coal put together for testing purposes, and which he did not apply in the case of other collieries, where the best coal was disposed of for house purposes, and the rest was sent to the poor gas manager. During the coal famine they paid 25s. a ton at Chesterfield, and were glad to get almost any quality; but now the coal trade was slack they could be more particular as to quality. He had heard, however, he had heard of a colliery while it looked very fair upon the face of it, was producing gas which had increased the cost of purifying 70 per cent. He attributed this to the sulphur in the coal. The sulphur was, as Mr. Eastwood said, thinly laminated—spread out on the coal—and if the coal were broken into very small particles, the small fragments of pyrites could be seen with the microscope. Such coal as is used at the present time for gas making, and it was absurd to suppose that coalowners could clean it; but corporations and companies would contract for what they considered to be the cheapest and best article, and it very often happened that bad was the best in coal of the character. Another question he should like to ask Mr. Eastwood was whether the Flockton seam was the same as was known in Derbyshire as the thick.

Mr. EASTWOOD said it was not.

Mr. JONES said there was another cause of variation in carbonizing coal, and that was exposure to the atmosphere. Particularly was that the case with the various coals of the South of England, where the coal they used the coal immediately it came from the pit, and carbonized it at once, the yield of gas would be 8 or 10 per cent. more than they would obtain after it had been exposed to the atmosphere for eight or ten months. Another feature he might be permitted to mention. Where the coal was exposed to the surface it was almost certain that it would be of inferior quality, and it was nearly unworkable. The deeper the coal the better it was, provided they took a fair sample, and did not allow the merchant to select the best for house coal, and send them the rest for gas-making. He thought the drainage of mines was also an important matter, because the water in the mines was a great deal of gas, and it was a great deal of coal. From some fiery mines he had had samples of coal which, when put under a glass, gave out gas from nearly all its pointed surface. That was particularly the case with rich bituminous coal, and this was an important reason why it should be used soon after it was obtained. He thought they ought to be all to be very strict in the quality of the coal contracts, as Mr. Eastwood had done, and then the next best thing would be to get coal merchants to observe them, which he had always found a very difficult matter indeed.

Mr. NEWBING congratulated Mr. Eastwood upon his research, and upon the manner in which he had treated the subject of the paper. Papers of this character, giving the results of one's own practical experience, were of unquestionable use to gas managers, and although it might be difficult to sit and listen to them as they were read over, yet when they were printed in the Transactions of the Institution they were of great use for reference. He was not at all sorry that Mr. Eastwood had confined his attention to a few coal seams. He did not think it was well for any of them to try and range over the whole field of knowledge, but they should rather confine their attention to a few subjects, and then they would be more likely to arrive at valuable results. As a matter of every-day practical experience, they knew that variations occurred in the quality of coal coming professionally from the same seam, the make of gas varying as Mr. Clarke said, notwithstanding all the care that was exercised. Gas managers were also well aware of the fact that the same seam of coal varied in quality in different districts. The singularity of this circumstance had

often struck him, and he had found it verified again and again. Quite recently he saw a paper which had been read before the Literary and Philosophical Society of Manchester, in which some of the causes of the variation in the quality of coal were dealt with. It was pointed out that seams of coal were materially affected by the nature of the strata which lay over them. If the strata were of an open character, such as sandstone, the gas of bituminous coal could readily escape, and leave the coal comparatively worthless; while, on the other hand, if there were a roof of almost airtight shale, or any other material of the kind, the opposite was the effect, and the gas was retained. It was also reasonable to infer that there must be some difference in the seam of coal when it was considered that on some parts of the bed vegetable matter would be irregularly deposited. It could be quite understood that during that vast primordial vegetable growth a large proportion of leaves and twigs would be deposited in one place, and in another, while in different places there would be an excessive deposition of bark or cellular tissue. All these would naturally tend to produce different results, and now when coal was examined these variations were found. In canal coal there was perhaps less variation in quality than in ordinary coal. Canals were supposed to have been formed from vegetable matter which had long been macerated in water, and one could therefore easily understand that there would be a more intimate admixture of the vegetable matter, and that a seam of canal coal would therefore have a more uniform quality throughout its entire extent. At the same time gas managers must be careful not to make these variations in quality a reason for not testing the coal, but to be careful to test it so that they, as gas engineers and managers, must not be ready to blame the varying qualities of the seams of coal whenever the quantity or quality of the gas varied. They must be careful to look after the heat of their retorts, and to see that there was no bad management. Managers might object to the cost of the tests, but it was a fair return for the trouble, and he knew that there were exceptions of that kind; but let them not make the coal a scapegoat for their own carelessness in looking after their works. Let them, on the contrary, do the utmost in their power to obtain the largest quantity of gas out of the coal. At the same time there could be no doubt that the quality of the coal was a matter of great importance, and being stacked at the pit's mouth. Gas managers might have the same quality of coal, and not know that it had been stored for a long time, and the consequence would be that when they came to use it they would be disappointed in the yield of gas. The paper which had been read showed that important cause of gas engineers' own mistakes, and it was not to be known. They should not only be chemists and accountants, but if they added to their other acquirements a knowledge of practical geology, their services would be more valuable to the profession.

Mr. ASKEW wished Mr. Eastwood to tell him in what portion of the seam he found the narrow seam of coal which was so much spoken of. He (Mr. Askew) had always had the impression that coal had been subjected to great heat, and that the gas being unable to escape, canal had been formed. If the canal occurred in the downthrow, it would favour this idea.

Mr. ROMANS, replying to the question, said he had had a very great deal of experience with canal, and it was always at the bottom. They had had a good deal on geology from their friend Mr. Jones, and on chemistry from Mr. Eastwood, but there was one thing practical to be said on this matter. There were certain works where really the managers could not keep testing the coal. He believed in testing with half a ton or more; he did not at all believe in testing with small quantities as 56 lbs. But there was this difficulty which some gas managers had—that their superiors did not like them to keep on testing. He spoke personally, from experience, and where he had been lately engaged there was a regular time for testing. It began at a certain time, at stated intervals, and it left off at a certain time. If the manager did not like to check up his assistant, he looked after the apparatus, and the engineer dared not touch it. The engineer merely looked on, but the coal merchant knew all about it—when it would begin and when it would end, and the whole thing was a farce from beginning to end. Every other place where he had been before the engineer would test the coal, and the manager would test the coal, and he kept the testing-place always in order, and he knew from experience that the moment the colliery proprietor was aware that So-and-so was a tester of coal, he took care that the house coal consumers did not carry off all the best. His opinion was that every gas manager should have the power of testing, and on any small quantities, and he would not be pleased if he must not do it. The manager was responsible for the works, and it was in the retort-house and not in the counting-house that the profit was made. If the engineer or manager was not to have a voice in the selection of the coal, and could not test for himself whether the quality paid for was supplied, he had no control over the quality of the coal, and he was not to be blamed if it did not cost a little money they would get it again from the coal merchant, who would take care to let them have good stuff.

Mr. HUTCHINSON (Barnsley) asked the meaning of the term "hard-band" coal; it was a term not familiar to him. As to the coal seams in the Barnsley district, there were several very good ones, but Silktone was the best. He noticed that in one of his tables Mr. Eastwood gave, as a result supplied to him, 10,250 cubic feet of gas from a ton of Silktone coal. He could only suppose that the person who supplied that had no stringent clauses in his agreements, like Mr. Eastwood had in his. Silktone was a favourite term, and many colliery proprietors had adopted it, but he was not at all at all in the case he was referring to could not, he should think, have come from the real Silktone seam.

Mr. EASTWOOD, in reply, said he was very highly gratified at the amount of interest which had been manifested in his paper. In answer to Mr. Clarke, he might more fully explain that he had had a different section of the seam. The seam might be 2 feet or 3 feet thick, but from top to bottom it was divided by horizontal partings into three distinct bands of coal. The terms "tops," "middles," and "bottoms," were, he thought, as clear as any he could use, and they were commonly employed at all the collieries in the district. He was not prepared to say, he had not been asked, whether he had confined his attention solely to the seams with which he was acquainted. Nevertheless, he might remark that he had found the Black Bed seam the best for producing the largest quantity of gas; but in using it care must be taken not to have the heat too high. He was sorry there seemed to be a misunderstanding as to the nature of the coal used. He said in the first part of his paper, that he was dissatisfied with the laboratory tests, and thought the different results might have arisen through greater or less fairness in selecting the samples of coal, and for this reason he resorted to working analyses of not less than 24 hours duration, and using not less than 20 tons of coal. These bore out

his previous tests. He considered 55 lbs. of coal a fair quantity for a laboratory test, and when he constructed the apparatus he thought he had, as the President said about another apparatus, gone to the extreme. It was, at all events, a practical apparatus for the purpose, for it was not always easy to get half a ton of coal for testing purposes. Mr. Jones complained that he had confined his experiments to the Flockton seam. He thought himself that he had confined his experiments too exclusively to the Middleton Main seam, and really he had only two analyses of the Flockton seam. He agreed with Mr. Jones that the quality of the coal varied with the depth, and he had a remark to that effect in his paper.

Mr. HUNTER inquired if Mr. Eastwood meant that it improved in quality with the depth.

Mr. EASTWOOD said yes. As to the question which had been asked about cannel, it happened that in the seam he referred to, the cannel lay on the top of the fault; so that this upset Mr. Askew's theory. He fancied himself that these faults had been caused long since the coal was formed. There was one peculiarity which he noticed in the Hiddings Colliery at Dewsbury, which bore out this idea. The best seam was in a perpendicular direction, but the coal had been drawn over and thinned out, so to speak, without the seam being broken. As to the remarks of Mr. Romans, he always kept the "police-man" at work, and he quite agreed with what was said, that if the colliery proprietors knew that frequent testings were made he was careful as to the quality of the coal supplied. The term used about which Mr. Hutchinson was in doubt, was "hard-band," and he applied it to a band of hard coal in the Middleton seam.

Mr. JONES remarked that his experience with reference to cannel was that it would be found in some cases in the middle of bituminous coal, in others at the top.

Mr. EASTWOOD referred to the fact, which, he said, he had noticed, that in one portion of the Middleton Main seam, as it approached Bertenshaw, the middle section was not coal at all, but cannel.

Mr. PRESIDENT said he had personally taken a great deal of interest in coal testing at various times, and he was most interested in the discussion on the subject. He felt sure he should read the paper through with very considerable pleasure, when it was printed. Mr. Eastwood had made a valuable contribution not only to the proceedings of the Institution, but, generally speaking, to the literature of gas engineering, and he published his paper, he believed, with a very valuable value. He (the President) was a little at issue with the author in some matters, but he would pass them over. One question that had been asked was, which was considered the best seam of coal for gas-producing purposes. He quite agreed with Mr. Eastwood that it was a very difficult question to answer, but his experience was that of the two—Flockton and the Black Bed—Flockton was the better coal. As to the remarks about the quantity of coal used in these tests, he agreed with Mr. Eastwood that half a hundredweight was sufficient for the laboratory. They could not expect to get in ordinary working the same results that they obtained in the laboratory tests, but he knew what the results would be, and he noted, which would find it out better in the laboratory test than by any other means; therefore they must not treat the laboratory test too lightly. He used less coal than Mr. Eastwood in his experiments—only one hundredth part of a ton, in fact; but this gave gas sufficient for any experiment he wished to make, and therefore answered every requirement.

Mr. HARRISON VEEVERS (Dukinfield) read the following paper:—

ON THE "STANDARD" WASHER-SCRUBBER OF MESSRS. KIRKHAM, HULETT, AND CHANDLER.

As one of the objects of our District Associations is to discuss improvements, real or supposed, in the apparatus used in gas-works, I need not apologize for offering you a few remarks on the working of the above washer-scrubber, and giving a few results. I do this simply because I have had one at work during the past few months; and whatever apparatus had been selected by me for the purpose would have been the same. My object is to show how beneficial in every way, even in small works, is the adoption of some means of taking up the ammonia and other impurities. Members who have had experience with other scrubbers and washers will be able to compare the results of the working of their apparatus with this.

The machine at the Dukinfield Gas-Works may be described simply as consisting of seven independent hollow cylinders, the periphery of each being composed of a number of sheet-iron plates—indented and close together—so arranged that the gas entering the centre and passing outwardly past the plates is forced to pass close to the plates, and comes in contact with the water on the surface of the plates. The cylinders are in a chest partially filled with water, and are all fixed to one axle passing through their centres, and are caused to revolve four to five times a minute by a small engine. A stream of pure water enters at one end and gas at the other. The water flows from one division to another and then flows away to the tar-well. The result of this intimate contact between gas and water is that the whole of the ammonia is dissolved, and while the water in the first division is almost pure—in fact, practically free from ammonia—the flow of water can be so regulated that any required strength of liquor can be produced for use in the last compartment.

As our contract for liquor did not embrace a higher strength than 6°, I found that, during the five months from the 1st of February last, to get this strength 12½ gallons per ton of coals carbonized were required, or 1305 gallons for each 1000 feet of gas passed through the apparatus. During the above period the quantity of gas was 2,400,000 feet, which yielded 28,314,000 feet of gas, and the quantity of crude ammoniacal liquor registered by a liquid positive meter was 168 tons. As the yearly quantity of cannel and coal used is 9400 tons, the total quantity of liquor will be 465 tons of 6° strength—which at 25s. per ton will realize £575. The first cost of the machine without foundations, connections, or power was £430.

Previously to the adoption of this apparatus we had no means of arresting the ammonia, and commercially it was all lost to us. The purifying is also done much more economically, though I have no data to show to what extent. A pressure-gauge on the inlet and outlet does not indicate the slightest difference of pressure. The register of the liquid meter is taken twice a day, and shows that the foreman have attended to the requirements of the machine. I had, as a trial, a meter fixed on the water inlet and outlet; but, finding no difference in the quantities passed, I removed the outlet one as being more liable to get out of order.

Discussion.

Mr. CHURCH (Blackpool) said he should like to know whether the gas was totally freed from ammonia by the use of the apparatus. Did Mr. Veevers test with lime, and find it necessary to add any?

Mr. DARTLEIGH (Glossop) said he erected one of these "Standard" Washer-Scrubbers in January last, suitable for a maximum production of 300,000 cubic feet per diem, and had found it a very effective machine—removing every trace of ammonia and a large quantity of carbonic acid and sulphuretted hydrogen from the gas. It also produced from 10 to 11 gallons of ammoniacal liquor of the strength of 6° to 7° Twaddell per ton of coal and cannel carbonized; and there was a considerable saving in

the purification account—the purification being saved in the time account, and over 4½ in. wages for the purchase of 17,058 (40 cubic feet of gas. It required very little motive power, as the horizontal shaft on which the discs were keyed was only driven at the rate of six revolutions per minute, working at a minimum of pressure. It fully accomplished all the patents stated, and was a valuable machine for the cheaper and more effectual removal of the impurities connected with the manufacture of gas. Mr. BRYAN (Beverley) said he was some time ago called in to a neighbouring works to advise as to some apparatus for taking out the ammonia from the gas. He had himself one of Walker's scrubbers, and the difficulties he had had to contend with, more specially in winter, induced him to recommend the adoption of the "Standard" Washer. It was better than the ordinary lower scrubber for small works, as it was under cover, and there was therefore less difficulty in preventing the freezing of the water. There were no means that he knew of preventing the freezing of the water in the tower scrubber in the winter, and it was often a source of great annoyance. Another advantage of the "Standard" Washer was the facility with which it was the quantity of water passed through the machine could be regulated. In the case of the tower scrubber, one had to go up every day and turn the three taps, while with this small apparatus they could test and regulate it at all seasons. As to the result, it was perfect, if the quantity of gas was first checked. The average production of the "Standard" Washer at his own works was 8½ gallons of 7° strength per ton of Silkestone coal, but he could give no statistics as to the "Standard" Washer which was erected. He agreed with previous speakers that the motive power required was very little. He fitted up a gas-engine to work the exhauster, and that engine worked this machine also.

Mr. HUNTER said he had been asked to examine the apparatus erected, and he recommended to his Committee the adoption of this washer. He could not, unfortunately, say much as to the result, because the apparatus had only been in use about five weeks; but he would give them the strength of the liquor in the various compartments as tested on the previous day; and he gave the figures as follows:—No. 1, 8°; No. 2, 6°; No. 3, 5°; No. 4, 4°. He had, therefore, a very large margin to deal with in future extensions. There was one great advantage in adopting this washer—it could be put under cover and protected from the atmosphere day and night. He had been able, with the thermometer at 50° in the shade, to deliver his gas in the winter, and he had no trouble with the apparatus, except the condenser and the gas-holder, which was not under cover. He simply made these remarks because he expected to obtain the same facilities in winter and summer for regulating the temperature, and also because he considered this the most effective scrubber or washer that had been invented. In the extreme south of France, he had seen apparatus he was running gas of liquor, leaving the other seven for water.

Mr. JONES agreed that in order to remove the ammoniacal liquor it was necessary to have an efficient machine, but in comparing one machine with another they ought to know what quantity of ammonia existed in the gas going to the washer. He knew what the results would be, and he noted, which would find it out better in the laboratory test than by any other means; therefore they must not treat the laboratory test too lightly. He used less coal than Mr. Eastwood in his experiments—only one hundredth part of a ton, in fact; but this gave gas sufficient for any experiment he wished to make, and therefore answered every requirement.

Mr. CLARKE (Ashton) wished to know the quantity of liquor obtained per day.

Mr. SAVILLE (Sowerby Bridge) said his idea of scrubbing and washing was that they should do as much as possible with ammoniacal liquor before they used pure water.

Mr. LAYCOCK (Keighley) had two objections to Kirkham, Hulett, and Chandler's "Standard" Washer. One was its cost, and the other the cost of the power required to work it. At the works with which he was connected there were one of the "Standard" Washers, and only about one-fourth of the washer Mr. Veevers had described, required no power beyond the extra pressure, and left no trace of ammonia in the gas. The apparatus described was, he believed, very efficient; but Mr. Livesey's cost less, was less trouble, was less expensive in working, and took out more ammonia.

Mr. HUNTER (Stalybridge) was very glad to hear that Mr. Laycock could extract the whole of the ammonia with the Livesey washer; he could not do it himself. He had one in use, and it took out scarcely any ammonia, but it enabled him to dispense with about 40 tons of lime in one year, the value of which, together with the saving in wages, had nearly paid for the washer during the first year, though it certainly did not extract the whole of the ammonia.

Mr. LAYCOCK said he omitted to state that he used a scrubber after the washer.

Mr. EASTWOOD said he was thoroughly acquainted with the working of the "Standard" Washer, and perhaps if he was in want of one, and had no apparatus in use at the works, he might adopt it. He had an apparatus similar to that which they had seen that day at the Halifax Gas-Works. It had been in operation for five years, and he found it useful, because it enabled him to regulate the strength of the liquor, and he had no trouble, and he took care the buyers had no more. All he had in connection with his machine was one pump. In three of the vertical compartments he used only ammoniacal liquor, and in the other compartment nothing but pure water. In summer or winter he could get the liquor about 5° strength, and the apparatus was so inexpensive that he thought it was the best.

Mr. COLLES (Tadmore) said Mr. Anderson's rotary scrubber was something like this of Kirkham, Hulett, and Chandler, only a brush was used instead of the thin plates.

Mr. HUNTER said he was also surprised that they had not heard something beyond the allusion of Mr. Saville as to the advantages of using strong ammoniacal liquor as a purifying agent. He had no doubt that a large quantity of carbonic acid gas was deposited when the gas came in contact with the liquor, and that there was a great deal of advantage in washing with liquor of very much more than the strength of the gas, so as to do away with the open purifiers now used, which were not only a nuisance, but were also costly from the way in which they had to be worked. Purification was a very important item in the cost of production, and the sooner they could get something to purify the gas by the better it would be. With regard to the scrubber or washer, he agreed with Mr. Jones that it was very important to know what amount of

ammonia there was in the gas before it went into the scrubber, because different classes of coal varied considerably as to the amount of impurity they contained. At the Halifax Gas-Works there was a tower scrubber at work, and the washers which they had seen. He had tried different kinds of washers, and all sorts of experiments with them, and he found that there was a great deal in washing.

Mr. VERVEES, in reply, said he had not been long enough at the Dukinfield works to state correctly what was the quantity of ammoniacal liquor per ton of coal before the "Standard" Washer was introduced, but the quantity in this machine was 12 gallons per ton of coal carbonized. He thought it was incorrect to say that because a still washer like Livesey's was used, therefore no power was required, because additional pressure had to be put on the exhaustor to pass the gas through the washer. As he had shown, there was in this apparatus not the slightest difference in the inlet and the outlet, and the other point was that the flow of water could be regulated much better than in most washers. The object of his paper was not to show the particular merits of this machine as compared with others, but to point out to managers of small works where there was no scrubber, the advantage which this one afforded over nothing at all. This apparatus cost £500, and it had saved £570 in one year.

The discussion then closed.

Mr. T. Newbigging exhibited and explained some detail drawings of a purifying-house and purifiers constructed for the Heywood Gas Company. The house was open in front, the other three sides being enclosed by a brick wall. The building was two storeys high, and the purifiers, which were above the house, were reached by a staircase. The purifiers were there was room for four more, and they were so arranged that they could be worked simultaneously or one after another.

Mr. T. G. Marsh, of Oldham, exhibited Thorp and Taker's patent electric lamp revolving governor for lamps, &c., and the same firm's "photometer," for showing at a glance the amount of gas passing in an hour. Both apparatus were in operation, and displayed considerable ingenuity in construction.

Mr. HUNTER moved a vote of thanks to the contributors of the various papers.

Mr. DELVERSE seconded the motion, and it was carried with applause. Mr. VEEBEN and Mr. EASTWOOD having acknowledged the compliment, the President moved a vote of thanks to Mr. Newbigging, for his kindness in laying the plans of the purifying-house before the meeting. The motion was cordially adopted.

On the motion of Mr. JONES, seconded by Mr. SAVILLE, a vote of thanks was unanimously accorded to the President, and the business of the day was brought to a close.

The members and visitors afterwards dined together at the White Swan Hotel—the President in the chair.

After the usual loyal toasts had been duly honoured,

Mr. JONES proposed "The Mayor and Corporation of the Borough of Halifax."

Mr. CORDINGLEY responded to the toast.

Mr. WEBER then proposed the toast of the evening—"The Manchester District Institution of Gas Engineers." He could not, he remarked, say that his knowledge of the Institution had been a very extended one, as it was only about a year since he first attended one of their meetings; but he knew them by reputation before that time, and he thought still as he thought then, that there was no district association of the kind throughout the whole of the country which did better work than this. He did not know that he need go into any great praise of them, because the papers which they read and the discussions which they held would exist, and he was sure the members would rather have the opinion of their professional brethren upon their productions than any fulsome after-dinner praises he could utter. He therefore asked them all to drink success to the Institution, and the health of the President, Mr. Carr.

The toast having been duly honoured,

Mr. DELVERSE, in responding, expressed his pleasure at meeting the members in Halifax, and at the fact that the gathering had been altogether a most successful one. He believed the meeting would bear comparison with any meeting they had had. The papers were of such a character that, when printed in their Transactions, the members would be able to read them back as something to which they could refer for information. He believed it was a good thing for them to be united as they were, and meet together for the discussion of scientific subjects, and enlighten each other upon them. They were animated by no selfish opinions. They had only one purpose in view—the improvement of the manufacture of gas. All they desired was that this country should not, so far as this one subject was concerned, be behind any other. They found sometimes that they were closely pressed by some of their continental friends in the matter of gas-making. In France, for instance, they were persevering in the matter of reducing the prime cost of the gas; but he believed that in this respect England was well behind them. In Germany, again, they found that they were pushing forward in many scientific ways, by producing new methods of heating retorts, and so on. In both those countries much good work was done through the medium of gas associations, which had a great advantage over those in England, inasmuch as they were supported by the gas companies. He was sure that they had a great deal to learn from the staff Gas Committee at their meeting that day, and that their meetings generally were attended by representatives of companies and gas committees, because they would, if they listened to the discussions and the reading of the papers, give them credit for being disinterested, and for desiring to push the interest which they had at heart as much as gas engineers had.

The toasts of "The Visitors" and "The Press" having been proposed and responded to,

Mr. JONES proposed the health of the Secretary, Mr. R. Hunter, of whose services the Institution he spoke in eulogistic terms.

Mr. HUNTER having briefly responded, other toasts followed, and an enjoyable day was brought to a close.

THORNBURY GAS COMPANY.—The half-yearly general meeting of this Company was held on the 31st ult. The accounts presented showed a large falling off in the consumption of gas, and the Directors consequently recommended a dividend of only 4 per cent. per annum on the paid-up capital. For several years past the Company have paid 5 per cent., after carrying forward a large sum to the reserve-fund account.

WEBER GAS COMPANY.—The third ordinary general meeting of this Company was held on the 19th ult.—Mr. G. Dawburn in the chair. The Directors reported a balance available for dividend of £933 16s. 6d., out of which they recommended the payment of an interim dividend of 2s. 6d. per share, free of income-tax, being at the rate of about 8 per cent. per annum on the ordinary capital of the Company, leaving a balance of £525 15s. 6d. to be carried to the next half-yearly account. The recommendation was agreed to.

THE GAS EXHIBITS AT THE MANCHESTER INDUSTRIAL EXHIBITION.

(FROM OUR OWN CORRESPONDENT.)

One of the most important sections at the Industrial Exhibition, just opened in the large Agricultural Hall, Fomona Gardens, Manchester, is that devoted to gas apparatus, and the large number of exhibits is no doubt, due in some measure to the fact that in this section silver medals have been offered for competition by the Gas Committee of the Manchester Corporation. Of course, it is not attempted to show the method of producing gas, nor can it be said that there is much that is really new to be seen in the application of gas. The exhibition is more an exposition of the vast variety of purposes to which gas can be applied, and especially of the great development which has taken place in its application to the purposes of cooking.

The most noticeable feature of the section is, indeed, the large array of gas-cooking apparatus. Whilst most of these are of the well-known type, there are some novelties in design and principle which may be noticed. Amongst those are Cox's patent "Save-all" gas-stoves exhibited by Messrs. Stark and Co., of Torquay, and the oxygenc cooking-stoves exhibited by Messrs. H. Green and Son, of London and Manchester. In each of these stoves a new principle has been introduced. In Cox's patent stove, ordinary fish-tail burners replace those of the Bunsen type, and a couple of these are sufficient to heat a large stove, whilst no gas or products of combustion are allowed to enter the oven. The construction of the oven may be shortly described as follows:—The heat, as already intimated, is produced by one or more ordinary fish-tail burners; these act in a furnace underneath the oven, which is surrounded by a small chamber into which the heated air from the furnace is passed. The cold air is driven out at an outer-pipe, the mouth of which is below that of the inlet-pipe to the furnace, and this enables the gas-flame to burn its own product. The hot air chamber is surrounded by a space of non-conducting material, and on the top of the oven are the usual burners for boiling; toasting and grilling being done by reflection.

In the oxygenc stove exhibited by Messrs. Greene and Son, who have also a large display of other gas apparatus, the heating arrangement is effected by the scientific combination of carbon, hydrogen, and oxygen, by which the combustion secured is so perfect that a chop or steak may be grilled on the oxygenc flame even better than by the use of coal. For roasting, the stoves are so arranged that a current of air is continuously passing between the fire and the joint, which is thus really roasted and not broiled. These stoves are already in use at the Agricultural Training School for Cooks, near South Kensington, and in connection with this exhibition, lectures are being delivered by Miss Smithard, from the above institution, on gas and its use as applied to cooking. By the aid of Messrs. Greene's stoves Miss Smithard practically demonstrates the great strides which have taken place with regard to the application of gas in this direction. The stoves are, in fact, so constructed that the arrangement, which had nearly driven gas out of use as a cooking medium, have been overcome.

We may add that in connection with Messrs. Greene's stand a photometer, with apparatus for comparing the illuminating power and consumption of gas by various burners, and a heat-testing room for comparing the heating power, consumption of gas, and effect on the atmosphere by different gas-stoves, &c., are being fitted up, but the arrangements were not completed when our notice was written. Of these and of other exhibits, which, of course, include gas apparatus of varied descriptions, mention of the however, sufficiently abounds to show, we must defer any further notice until we are able to give the judges awards.

EXHIBITION OF GAS APPARATUS IN DUBLIN.

An exhibition of gas apparatus, organized by the Alliance and Dublin Consumers Gas Company, was opened in the Connaught Hall of the Exhibition Palace on Monday, the 6th inst., and will remain open, day and evening, until the 12th inst. The next day, Tuesday, the 13th, is a merely nominal one, and the interest manifested in the display of gas-cooking apparatus has, we understand, proved to be far greater than was anticipated. All the well-known makers—Messrs. Leoni, Messrs. Wright and Co., Messrs. Billing and Co., Messrs. Curtis and Sons, Mr. C. Wilson, and Messrs. Edmundson—have exhibited to show the variety of appliances that every requirement, from the double gas kitchener to the modest boiling and grilling stove suitable for the artisan, may be satisfied. In gas fires, Messrs. Edmundson's exhibition is marvellously tempting, as they show not only the common type of stove with copper reflector, but a large variety of elaborate and artistic designs.

In connection with this exhibition a word should be said with special regard to the high-power burners exhibited by Messrs. Edmundson, Dublin being, so to speak, the birthplace of Mr. Wigham's inventions, which have attracted so much attention. At the present exhibition the first thing that strikes the eye is the enormous lamp erected by this firm in front of the main entrance. This lamp, which is on Mr. Wigham's patent, is estimated to be equal in illuminating power to more than 2000 candles. Powerful as this light is, it is yet greatly surpassed by Mr. Wigham's lighthouse burner, placed at the end of the courtyard. The beam from this burner is thrown across the courtyard, and is directed by a ray leading to the colonnade of the building, and illuminates it in a most extraordinary manner. Of course, such large lights as these are not applicable in all cases, although it is interesting to know that the much-valued electric light would certainly be hard pressed to produce such results. The same may be said of the large gas burners. For purposes requiring less diffused light, and greater concentration, Messrs. Edmundson exhibit what they term a railway station lamp. It is hung at the entrance of the colonnade, and throws a strong and intense light for 20 or 30 yards around it. The principle of the lamp is quite new, and it is the only example of great interest in the construction of lamps. Within the exhibition itself Messrs. Edmundson and Co. exhibit a horizontal silent gas-engine of 31-horse power, and one of 1-horse power. The latter is arranged in connection with the fog signal apparatus patented by Mr. Wigham, and occasionally its powerful though somewhat unpleasant note is sounded, for the information of those who are interested in lighthouse appliances.

There are, of course, the usual water heaters, improved burners, and the other accompaniments of a gas apparatus exhibition; and, as on previous occasions, a lady from South Kensington discourses on the merits of gas as a fuel for cooking purposes, and gives practical illustrations of nearly every branch of useful and ornamental cooking.

BATH GAS COMPANY.—At the annual meeting of this Company recently held, the payment of maximum dividends was recommended on the whole of the paid-up capital, amounting to £6112 10s., leaving a balance of £423 17s. 9d. to be carried forward.

REDUCTION IN THE PRICE OF GAS AT WESTON-SUPER-MARE.—The Directors of the Weston-super-Mare Gas Company, at their last half-yearly meeting, resolved to reduce the price of gas from December next 3d. per 1000 cubic feet, which will make the charge 4s. per 1000 feet, subject to discount according to consumption.

HASTINGS AND ST. LEONARDS GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Thursday, the 2nd inst.—Mr. G. SCARVEN in the chair.

The following report of the Directors was presented:—

The additional retort-house alluded to in the last report is now in a forward state, and it is hoped will be completed in time to assist the carbonizing departments during the coming winter. In order to meet the expenditure consequent on this outlay, the remaining £5 per share on the last issue of 37½ shares will be called up for payment on the 1st of October next.

The accounts, certified, leave a balance of £1113 11s. 8d., which, with the amount from the last half year, gives the sum of £5322 8s. 7d. to be dealt with by the Shareholders; and it is proposed to pay a dividend at the rate of 10 per cent. per annum on the 37½ shares, and at the rate of 7 per cent. per annum on the whole of the other stock of the Company; it is also proposed to pay the sum of £1 per share to the Shareholders of the £35 shares, on account of the arrears of statutory dividends due on these shares. There is also a balance of £115 15s. and leave a balance of £1943 15s. 7d. to be carried forward to the next account.

Mr. J. Brown, Mr. E. Hayles, and Mr. N. Parks retired by rotation from the directorship of the Company, and offer themselves for re-election.

One Auditor, Mr. F. Bennett, also retired by rotation on the present occasion, and again offers himself for re-election.

The CHAIRMAN, in moving the adoption of the report, stated that a new retort-house was being erected close to the works, and it was hoped that it would be ready to use, or partly so, before the next meeting of the shareholders.

The building was one of very considerable size, and he hoped it would answer the purpose for which it was intended. The Directors had recently issued a card of instructions to consumers how to act in the event of an escape of gas, and he trusted there would be fewer accidents in the future.

Mr. J. H. COOK seconded the motion.

Mr. WALTER expressed his satisfaction at the report, and the large amount earned by the Company. He remarked that the consumers might think some abatement could be made in the price of gas, but he was of opinion that this would be to meet the expenditure consequent on the works, and he considered what risks the Company incurred by accidents, and he believed they would think the original Shareholders were entitled to their dividends before any further reduction was made in the price. If the matter were fairly put before the public they would see that the payment of the back dividends was ought to be made.

Mr. J. COCK seconded the motion.

The SECRETARY (Mr. W. B. Young), in reply to Mr. Elkin, said the Company's premises and plant were insured for £20,000 or £30,000. That sum did not affect anything outside the premises.

The ENGINEER (Mr. A. H. Wood), alluding to the question of risk, referred to the accident which had taken place in Wood Street, Chesapeake, London, some years ago, which cost the Gas Company £100,000, and a serious accident had also occurred through a steam roller in one of the streets at Brighton. About a week previously an accident which might have been attended with most serious consequences occurred in the Grosvenor Place, Hastings. Some excavations had been made there, opposite the Alexandra Hotel, and the hole had been filled up in the usual manner the steam roller went over the spot. An hour after midnight the main-pipe, which was 5 feet below the surface, was smashed, and the gas was forced into the hotel. Fortunately, a police-constable smelt the gas, and gave warning at the gasworks, and in an hour from the occurrence the men were at the site, repairing the damage. The Company were always liable to this sort of thing, especially when a steam roller was at work.

The motion was carried unanimously, and the retiring Directors and Auditors, having been re-elected, a vote of thanks was accorded to the Chairman, and the proceedings terminated.

SUNDERLAND GAS COMPANY.

The Annual General Meeting of this Company was held on Wednesday, the 1st inst.—Mr. E. C. ROSSON in the chair.

The report of the Directors, which was taken as read, was as follows:—The Directors herewith submit the accounts for the year ending June 30, 1880. After a consideration of the present position and prospects of the Company, and of the various interests committed to the Directors, they themselves varied in recommending such a reduction in their scale of charges for gas as will make the net price for prompt quarterly payment 2s. 7d., 2s. 3d., and 2s. 3d. per 1000 cubic feet, according to the quantity consumed.

An interim dividend was paid in March last, and your Directors now recommend the declaration of a further dividend of 5 per cent. on the original stock and 4½ per cent. on the additional capital stock of the Company. They also recommend the payment of 3s. per share on the original stock of the Company, on account of the deficiency of the dividends of previous years.

The retiring Directors were Messrs. James Hills, James Stokoe, Henry Taylor, and James Laing. The retiring Auditor is Mr. H. G. Armstrong. The whole of the above are eligible for re-election, and offer themselves accordingly.

(The statement of accounts showed that upon the income and expenditure of the Company for June 30, 1880, there was a balance in favour of the Company of £1,519 6s. 10d.)

The CHAIRMAN, in moving the adoption of the report, said the history of the Company during the past year had been one of uniform quiet success, and he did not present a single point upon which he could dwell. When the Shareholders considered the Company's income and expenditure, they would find that there was scarcely any difference between those of the past and those of the previous year. The profit for the year was amply sufficient to pay the statutory dividend, and also to give those who had been Shareholders from the beginning a bonus towards making up the deficit of the former years. Think the Directors of satisfactory, seeing that during the last six years the Directors had made no less than five reductions in the price of gas. They had estimated the reduction of last year as equal to £1000 put into the pockets of the public, and yet it would be seen that there was only a decrease of £194 in the rental. Stimulated by this experience, which had been uniform over the four or five reductions hitherto made, the Directors now proposed to present the public with an equivalent to £2000 more, in the shape of another reduction; but he trusted the Company would be recompensed by the liberality in the use of gas, and that the various modes in which it could be employed other than those giving rise to the deficit of the public, and that thus the Company would be enabled to maintain their present excellent position, notwithstanding the sacrifice of £2000 they were making. The Company had at present some £13,000 in the bank and the dividends amounted to £11,000. With the exception of current week to week accounts, there was no positive out of debt.

The motion was seconded, and carried unanimously.

On the motion of Mr. RICHARDSON, seconded by Mr. F. VINT, the dividends recommended in the report were declared.

The retiring Directors and Auditor were then severally re-elected, their fees being respectively increased by £100 and £5 5s. per annum.

The proceedings then terminated.

At the conclusion of the business meeting the Shareholders present were conveyed to the Company's works at Hendon, for the purpose of inspecting the improvements they have recently been made. The extensions of the working plant are consequent upon the success which has attended the Company's operations of late years, and the increased demand for gas. They have been in progress for some time, and have been carried out in the most complete and substantial fashion, under the direction of Messrs. T. and C. Hawksley. It is contemplated by means of this extension to more than double the gas-producing power of the Company, so that they may be in a position to meet any demand which renewed commercial prosperity may enable Sunderland to make upon them. Mr. C. Hawksley and Mr. Jolliffe (the Manager of the works) acted as guides for the visitors, who were conducted first of all through the old retort-house. Passing thence to the new retort-house, they were enabled to see the contrast between the old and the new mode of working. This house, which will contain 336 retorts, is 250 feet long and 52 feet wide, and has on either side coal sheds of equal length, and 30 feet in breadth. The coal waggon runs into the sheds upon tracks, connected with the North-Eastern Railway, which runs close by. The hydraulic mains and the condensing apparatus are also constructed upon an improved principle. The new purifying-houses were also visited, and the inspection closed at the handsomely fitted new meter-house, where several ingenious automatic arrangements for indicating the operations of the men in the retort-houses, the pressure of gas in the town, &c., were objects of much attention.

With the old works the Company were able to manufacture 1,250,000 cubic feet of gas per diem; but when the extensions are completed they will be able to produce daily, if necessary, 2,750,000 cubic feet. The whole additional capacity of the retort-house is 1,500,000 cubic feet. The most facture of 1½ million cubic feet of gas per day, with all necessary connections; three new boilers, each 20 feet long by 5 ft. 6 in. in diameter; three new exhausters and engines, each capable of passing 63,000 cubic feet of gas per hour; and one additional meter to pass 60,000 cubic feet per hour; a new 2½ in. gas pipe, each 100 feet long, to connect the retort-houses with the hour; new water and gas pumps; with two engines for working them; and a sulphate of ammonia house constructed to produce ten tons of sulphate per day. This building was set apart for luncheon, which was partaken of by a numerous company, the Chairman of the Company (Mr. G. C. HAWKSLEY) presiding. The number of the guests were proposed, including "Continued Prosperity to the Sunderland Gas Company," "Our Sister Gas Companies," "The Engineers," "The Trade and Port of Sunderland," and "The Officials," and each having been suitably responded to, the proceedings ended.

WAKEFIELD GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on the 16th inst.—Mr. W. BRATTON in the chair.

The CHAIRMAN said all the Company's works were in good condition, yet the Directors were improving them. They were constructing a new gas-holder and condensing apparatus. The condensation was gradually becoming insistent, and the Directors had availed themselves of the present improvements in condensation, by which they hoped to make gas purer than it had hitherto been. The cost of this alteration would be about £1000, and it was proposed to pay out of the revenue the greater part, and the remainder would be charged on the coming half year's income. The leakage had been reduced to 10½ per cent. The illuminating power of the gas had been maintained at the average of 17 candles. The Directors had always endeavoured to keep the gas as free as possible from sulphur and ammonia, but by an improvement of the machinery they hoped still further to reduce the quantity of this impurity in the gas. With regard to the accounts, although the Company's gas sales had amounted to 470,000 cubic feet, there was a reduction of only £58 for the half year in the income. They had expended £450 less than they did a year ago in the manufacture of gas. The profit for the half year was £6165 19s. 4d., against £5862 in the corresponding six months of last year, so that there was £303 more profit, and this notwithstanding the reduction of the price of gas. The Directors proposed to carry a sum of £1243 11s. 7d. to the reserve-fund, which would then stand at £26718. Their insurance-fund amounted to £27878 19s. 6d. The Directors considered the statement of accounts a satisfactory one, and he begged to move that they be passed.

The retiring Directors, Messrs. E. C. ROSSON and Mr. R. G. AKED, were re-elected, and Mr. G. V. ELLERTON was again appointed one of the Auditors.

On the motion of Alderman HOWDEN, seconded by Mr. ROBERTS, a sum of £25 was voted out of the funds of the Company for a dinner to the Shareholders at the next half-yearly meeting.

A vote of thanks to the Chairman closed the proceedings.

RICHMOND (SURREY) GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held on Thursday, the 26th inst.—Mr. F. CHAPMAN in the chair.

The SECRETARY (Mr. E. B. Blott) read the Directors report, which stated that the result of the business of the Company for the half year ending June 30 last enabled them to recommend the payment for that period of a dividend of 5 per cent. on the original capital, and 4½ per cent. on the new capital, being at the rate of 10 and 9 per cent. per annum respectively.

The CHAIRMAN, in moving the adoption of the report, congratulated the Shareholders on the success of the Company, and said that the Directors were happy to be in a position to recommend full dividends. There had been a considerable outlay this year; but it had been necessary in order to keep the works in thoroughly efficient order, apart from the expenditure in improving the purifying plant of the Company, so that they might have their gas as pure as the sulphur and ammonia which were coming from gas companies into trouble; not that it was the fault of the companies, but more often that of the consumers themselves in not looking to the efficiency of their burners. A lady lately complained to him about the dimness and impurity of the gas; and it came out in conversation that although she had been burning gas for 30 years, she had never once thought of changing her burner. He advised her to have the burners changed at once, which she did, and found the gas very much better. This was the real cause of all the complaints they received about the gas—the fittings were generally out of order, and people did not attend to the proper ventilation of their rooms. The Directors were looking forward to the probability of a large increase in consumption. Gas companies must be always looking to the future to see whether they were in a position to meet the increasing demands made upon them. According to the terms of their Act of Parliament, if people wanted to be supplied with gas they were bound to do it, and if they failed to supply it in sufficient quantity and of proper purity, they, of course, got into trouble. The Directors, therefore, were contemplating the probable increase in the consumption of gas with the building that was going on in the neighbourhood,

proposed that the Corporation should pay the actual cost the Company might be out of pocket and no more, the sum to be fixed weekly or monthly as the Corporation pleased. The Directors thought this proposition fair and reasonable, for as the making of gas was the business of the Company, this repairing of the lamps was outside their business, and they thought they should not be anything out of pocket by the transaction. He did not remember hearing any expression of disapprobation of the proposal, and he offered no objection to it, and was never intended to be the cause of dispute between the parties. On the same occasion the Directors complained of what they thought a very unfair method of lighting the public lamps by the Corporation officials. It had been the practice of the men lighting the gas to pass by the meter lamps, lighting the lamps without meters, and then, on their return, and a late when a good deal of the gas had been burned, coming back and lighting the meter lamps. The Directors informed the Corporation that they suffered a heavy pecuniary loss by what they considered to be a very unfair way of dealing with the public lighting of the city. The Committee of the Corporation expressed their surprise and disapproval of any such thing, and the Mayor requested the Directors to put their complaint in writing in reference to this subject. They did so, and the next day furnished that complaint to the Corporation, with a statement referring to various lamps in different parts of the city. They had been for a considerable time watching the way in which those lamps had been lighted, and had kept detectives in different parts of the city, so that the Directors were enabled to put before the Corporation facts which they considered were of such a startling nature that would produce an immediate investigation, and cause the Company to be treated in the ordinary honest way of dealing between honest men. The Directors were not properly, however, the Directors never had a single notice taken of their complaint until the 7th or 8th of May, when the Company were going to Parliament with their Bill. The Company brought this complaint before the Committee of the House of Commons, and when they were challenged to bringing forward any evidence, they had no evidence to bring forward for examination; but the Counsel for the Corporation declined to cross-examine him. The next point discussed at the conference was the question of lighting the city. An intimation of adopting the sliding scale was brought forward, and it was discussed by the united Committee of the Corporation and the House of Commons, and the result was that finally the Company were asked to tender for the public lighting of the city for the ensuing three years, according to the old system and also according to the sliding scale. The Directors explained that it was impossible for them to give a tender under the sliding scale unless they were enabled to put their complaint before the Corporation, and the system was sent in to the Corporation the next day, and, of course, the Company took the necessary steps to bring the matter before Parliament, which was done in November, when notice of the Bill was given, although the Bill itself was not lodged until the 17th of December. From that day to the present, the Corporation have been in the habit of putting the Corporation disapproving of their action in going to Parliament for that Bill. In fact, so little was the objection the Corporation seemed to attach to it, that more than once the question of the sliding scale had been approved of. The Committee made a report to the Corporation in which they recommended that the contract be entered into on the terms already published. The recommendation of the Committee was the unanimous opinion of the Committee, and whether there were many or few members present it was not the business of the Company to go about testing it one way or the other, and they consequently could not see no reason why they should hesitate to go on with their Bill. He made those remarks in consequence of a statement which fell from the Mayor on the last occasion on which a discussion took place with reference to the action of the Company in putting forward the Bill. The Mayor said that neither the Corporation nor any Committee of the Corporation ever notified the Company to go to Parliament, and that a statement like this coming from the Mayor would bear great weight and force than from others who interested themselves in the matter. However, the Gas Company were fully authorized in everything they had done, and they did not unnecessarily tax the consumers or the Shareholders by their action. He said that the Bill was introduced in the House of Commons heard both sides, and the case of the Company was very strongly put by their Counsel. The Company's witnesses gave evidence that they should have 4s. 6d. per 1000 feet as the initial price for the gas, and the evidence of the Corporation witnesses was equally strong, and the House of Commons finally fixed the price at 4s. 3d. per 1000 feet. The Committee decided on splitting the difference, and fixed on 4s. per 1000 feet as the initial price. Immediately on this decision being come to, there was a consultation of the Company's Counsel and Engineers, and it was their unanimous opinion that if the Bill were accepted the Directors would be sacrificing the interests of the Shareholders, and as a consequence they would only be able to pay 8 per cent. dividend, and if the price offered by the Corporation were accepted the Shareholders would only get 7½ per cent. When the Directors returned to Cork the question was again debated. They considered that all the expenses they had been incurred could have been avoided by some consideration on both sides. With that hope the Directors decided to offer the gas to the Corporation at the initial price of 4s. 3d. per 1000 feet. This offer would give the Company an opportunity of getting a little more for the statutory dividend. It was the intention of the Corporation that the Bill was brought to serve the Company and against the Shareholders. The Company went to Parliament to benefit themselves, and they also believed they would benefit the consumers. He would wish the Shareholders to remember that a reduction of 1d. in the price of 1000 feet of gas would represent a saving of £2000 a year to the consumers, and a saving of 4d. would represent a loss of £2800. The Directors made this offer of 4s. 3d. to the Corporation, but they declined to accept it. He was very glad they had done so, for the Shareholders would now get a dividend of 8 per cent., which was as secure as any preference share in any railway in the United Kingdom. As the Corporation were to pay the margin of 1d. per 1000 feet, which they could call upon from the consumers, and if they raised the price 9d. they would add £5000 a year to the income which they could fall back upon to make up that 8 per cent. when an emergency might arise. If it were true, as had been sworn to by some experts in the House of Commons, that the gas could be supplied in Cork at the price of 1000 feet, the present Company could supply it as cheaply as anybody else. The Company considered they supplied the gas in a manner that could not be done better by any other company, considering all the surroundings. Therefore, if gas could be made for 3s. 6d. per 1000 feet, they had a margin of 4d., which would represent a saving of £2800 a year to the consumers, and this could go to support the payment of the 8 per cent. dividend, so that the Shareholders were sure of the 8 per cent. dividend, no matter what circumstance might arise. They might have a coal famine, as on a previous occasion; but the Company would always be in a position to ensure the payment of the dividend. The Company were very anxious to avoid the mismanagement; but he could assure the meeting that the officials took as much interest in the Company as if it were their own private concern. In conclusion, he repeated that the Directors had never received from the

Town Council a single official notice disapproving of the Company's action in going to Parliament.

Alderman KILIAN, as a member of the Corporation, considered the whole body should not be blamed for the acts of a few. When a man of Mr. G. W. Stevenson's character, whose opinion stood so high, represented that gas could be supplied in Cork for 3s. 6d. per 1000 feet, the Corporation, as the representatives of the ratepayers, were perfectly right in insisting upon this. Mr. Stevenson was the person who was to be believed, that they could have gas at 3s. 6d. per 1000 feet, and he trusted the Gas Company would come forward and give them gas at 4s., thus putting an end to all differences. He thought a good deal of expense might have been saved if some kind of arbitration had been arranged.

The CHAIRMAN said that it would be impossible to have any arbitration unless the two parties consented. More than once the Directors intimated that they were prepared to enter into an amicable arrangement, but they had received no proposals. The Directors showed their willingness to try and come to some settlement by the fact of their going to an informal meeting of the ratepayers' Association. On the occasion the Secretary put forward the views of the Directors, and made a proposal to supply gas at the same price as supplied in London by the largest Company in the world, and if the people were not content to have the gas at that price he thought it was very unreasonable.

Mr. MCILROY said that the only way to meet them was to supply good gas. The CHAIRMAN: We have not had a single complaint as to the quality of our gas.

The SECRETARY: The gas supplied by the Company has been tested twice a day by the Corporation officials for many years, and there has been no complaint as to the quality of the gas. It is supplied at 4s. 3d. at the office, and also at the gas-works, and has always been found to be 15 or 20 per cent. above the standard the Company are obliged to supply.

Mr. G. ANDERSON, the Company's Engineer, said he was very sorry that after all the liberality with which the Company had acted for many years, he should have to say that the Corporation had been so much disappointed by the citizens of Cork, or some of them, were so unkind as to find fault with them. He did not know any company that had been more successful than the Cork Gas Consumers Company, nor one that had supplied gas at a cheaper rate, considering many circumstances. They commenced when gas was 10s. per 1000 feet, and the first year they brought it down to 7s. 6d. per 1000 feet. In addition to this, in consequence of the old Company reducing the price by 2s. 6d., this Company supplied gas at 4s. 6d. per 1000, which was 1s. per 1000 less than the people were told they would have the gas for. From that time the Company had lowered the price until they brought it down to 4s. 3d. per 1000 feet. He did not know that the Company should blame those parties, either in the Corporation or amongst the citizens, who spoke against them; because, having an expert to advise them, if he said the price should be a certain sum, how was any member of the Corporation to contradict him? However, the Corporation were not to be blamed for the common sense, which ought to have enlightened the men of any Corporation who understood business. Mr. Stevenson, on cross-examination, had to admit that in arriving at the initial price of 3s. 6d. he had only taken the expenses appearing on the Company's revenue account. He did not take into account the charges of the Corporation, and the charges of the Corporation. Those expenses amounted to £1500 or £1600 per year, and included the general charges incidental to a large concern. Mr. Stevenson had to admit that he did not calculate on those. He (Mr. Anderson) saw in some of the papers that he had been reported to have stated that gas cost not more than 10s. per 1000 feet, and that was the only evidence he had. He said 4s. 6d. was the lowest price the Corporation should take as the initial price for gas; if they went above this, they would have to reduce their dividend, and if they went below it they would increase their dividend. He said that the Act of 1847, all gas companies were allowed to pay 10 per cent., and every company had followed this out, and if this Company were as wise as they now were, they would also go in for 10 per cent. Another complaint made against the Company was that they had tried to get their dividend increased from 10 to 12 per cent., and that they had done so in the House of Commons Committee. Now, the Company had continued to sell gas at 1s. per 1000 feet less than they ever promised, and, seeing this, he thought they were justified in taking the course they did. The Committee simply decided on dividing the difference, and the Company could not, with any gas at 10s. per 1000 feet, they were enabled, at present, to make a reduction of 4d. per 1000 feet, in consequence of the very low rate at which materials had been selling for some time past, and the freights of those materials at present actually cost the Company less than the shipowners. The same with the colliers; they were all working at a low rate because the supply of the article produced was greater than the demand for it. But suppose the trade of the country improved, why should not the price of coal rise to the average for the past 30 years? and if the price of coal went up, the Company could not sell their gas for 4s. 3d. per 1000 feet, but they would now be 3s. 4s. or 4s. per 1000 feet. The Company had to put up when the vote was taken. Could the Company believe that the Directors could manage to screw out 8 per cent. on 4s. 3d. per 1000, with their present expectations regarding coal and labour? He was very much of opinion that the Company had been too liberal to the consumers. The law took them in, and that showed a result, and in the House of Commons, as happened 10 years ago, when the Company were actually reduced to 5 per cent. dividend, and the shares fell from £8 to £5, and many of the Shareholders sold out at this price. A contingency like this might happen before this time, and the Company would be in a position to take it. The Company became disturbed, every vessel might be engaged, and the freight become very high. It appeared that by making a reduction from 4s. 6d. to 4s. 3d. per 1000 feet the Company were lessening their income by something like £2800; that was, if they had had the price at 4s. 3d. for the last half year there would be £2800 less, but the balance of the balance would be £400 instead of the £8000 profit. At that time the coal was so high that the balance of the Company went down to £1600. He did not think this prudent at the present time, and the Company should, as the law allowed them, add to their reserve-fund. They would also have to have to make some improvements in the works, and he had mentioned in his report. He found that the consumption of gas was increasing, and they had to put on increased pressure. The moment there was increased pressure there was a complaint of bad gas. To meet this, and in order that there should be sufficient pressure, they had to increase the pressure, and they had to put on increased pressure, and this would, according to his calculation, cost very nearly £2000; but the old mains, which would go to stock, would reduce the expense by £200 or £300. He thought it was not prudent for the Company, under the present prospects, to take this large sum out of their reserve-fund, and he thought they should take it out of the other 2d. during the next twelve months, according as the Company could see whether they could do so or not. The proportion of the reduction was very little to each consumer, but it

was a matter of considerable importance to the Company. The expenses of new works also required that a depreciation should be formed, and then, as had been remarked, there might be an explosion, and therefore the Company should have "shot in the locker" for anything of that sort. He would say reduce the price to the consumers as much as possible, but consider yourselves as well; and he thought the Shareholders were not considering themselves in making this reduction.

The SECRETARY said he might remark that in 1867, when coal was as cheap as at present, and labour far cheaper, Mr. Stevenson recommended that the initial price should be 5s. per 1000 feet, and he now recommended that the price should be 2s. 6d. per 1000. He might also state that Mr. Stevenson gave evidence a short time ago on the Londonderry Gas Bill, to the effect that the Londonderry Company should charge 5s. 9d. per 1000 feet besides meter-rent, and have a dividend of 10 per cent. If the Londonderry Company reduced their dividend to 8 per cent., they would be entitled to charge 8d. more than the 5s. 9d., and this would give them 6s. 6d. in addition to the meter-rent, which would be a good deal more if the extraordinary taxation on the Gas Company in Cork were taken into account as compared with any other company. It all came to this, that 6s. 9d. was the right price for Londonderry, and 3s. 6d. the right price for Cork.

Mr. B. J. ALCOCK proposed that the motion, which was carried unanimously. Mr. B. J. ALCOCK proposed that a dividend of 9 per cent. be declared on the paid-up capital of the Company.

Mr. FRYER seconded the motion, and it was agreed to. The retiring Directors and Auditor were severally re-elected, and a vote of thanks to the Chairman terminated the proceedings.

METROPOLIS WATER SUPPLY.

The following are the returns made by Dr. C. Meymott Tidy, M.B., &c., on the Composition and Quality of the Metropolitan Waters in August, 1880:-

[The results are stated in grains per Imperial gallon of 70,000 grains.]

Names of Water Companies.	Total Solid Matter.	Oxygen required to combine with Organic Matter, &c.	Nitrogen. As Nitrates.	Ammonia.	Before Boiling.	After Boiling.	Hardness (Clark's Scale).
<i>Thames Water Companies.</i>							
Grand Junction	18-72	0-072	0-142	0-000	14-3	2-4	
West Middlesex	19-76	0-080	0-125	0-000	14-3	2-0	
Southwark and Vauxhall	18-89	0-080	0-125	0-000	14-3	2-4	
Chelsea	18-82	0-120	0-125	0-000	14-3	2-6	
Lambeth	19-72	0-080	0-125	0-000	14-3	2-8	
<i>Other Companies.</i>							
Kent	30-17	0-000	0-410	0-000	21-2	5-2	
New River	20-14	0-028	0-142	0-000	14-8	2-4	
East London	30-25	0-036	0-187	0-000	15-4	2-8	

Note.—The amount of oxygen required to oxidize the organic matter, nitrates, &c., is determined by a standard solution of permanganate of potassium for three hours.

The water was found to be clear and nearly colourless in all cases.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The Executive Committee formed for holding an exhibition of gas apparatus, &c., in connection with the Philosophical Society of Glasgow, during the four weeks commencing on the 28th inst., held a meeting on Friday at the office of the Secretary and Treasurer, Mr. John Mann, C.A., and Dr. Wm. Wallace, Gas Examiner, in the City in the chair. Favourable reports were made as to the progress of the labours of the various Sub-Committees, and it was confidently anticipated that, from the applications for space by intending exhibitors, and further promises of hearty co-operation on the part of many persons, there would be an unusually interesting and instructive exhibition. On the motion of Mr. A. Lindsay Miller, Secretary of the Sanitary Section of the Philosophical Society, seconded by the Chairman, it was unanimously resolved to appoint Mr. John Mayer, F.C.S., Superintendent of the Exhibition.

It is very satisfactory to know that Pintsch's system of lighting buoys for river navigation is now making decided progress, the evidence being obtained from the action of the Clyde Lighthouse Trust, of which evidence of that body held last Wednesday it was resolved, on the recommendation of the Chairman (Mr. Thomas Henderson) and the Committee of Management and Finance, that as the experience gained with the gas-lighted buoy at Roseneath Patch had been so very satisfactory, it should be retained there permanently, and that one should be ordered for Garvel Point, and another for Skelmorlie Bank. On the following day several members of the Trust, accompanied by Provost Sommerville, of Port Glasgow, made an inspection of a number of sites which have been proposed for the erection of a gas-works in that burgh suitable for the manufacture of gas for those buoys.

The annual general meeting of the Bervie Gas Company was held on Monday last week—Mr. R. Glegg, banker, in the chair. An abstract statement of the income and expenditure for the past year was submitted by the Secretary, and it was resolved to declare a dividend of 3 per cent. The Directors were re-elected, as was also Mr. A. Lindsay, Secretary and Manager; and the Directors authorized the Treasurer to enter legal proceedings against all consumers two quarters in arrear with their accounts.

At a meeting of the Town Council of Aberdeen, held on Monday, the 6th inst., the proposed Borrowing Powers Bill was brought up for consideration by a report from the Finance Committee. In connection with the gas supply undertaking of the city, it was proposed by the Committee to obtain power for borrowing the sum of £55,000 for new gas plant, &c., and to reduce the illuminating power of the gas from 30 to 20 standard candles. The additional works proposed would consist of re-erecting house coal-stove, purifier-house, and purifiers, £11,050; gas-holder and two tanks, £23,000; gas-mains, £8700; and meters, £7500; with contingencies estimated at £4750. In referring to the proposed reduction of the illuminating power of the gas, the Lord Provost remarked that, as was explained in the Committee's report, the Aberdeen Gas Company only required 14 candles. In Dundee the legal minimum illuminating power of the gas was 18 candles, and in Edinburgh and Glasgow it was 25 standard candles; and in Aberdeen the illuminating power had of late been higher than in any other town in Scotland. After a considerable discussion it was agreed to ask powers to borrow £30,000 for improving the existing gas-works, £24,000 for additional water-mains for the city and suburbs, £3750 for new pumping-engines at Culter, including site, and £2950 for contingencies.

After the subject has been long talked of in the town, and occasionally referred to at meetings of the local municipal authorities, it was unanimously resolved, at a special meeting of the Town Council, held at Helensburgh, held last Thursday, to adopt the Burghs Gas Supply (Scot-

land) Act, 1876; and it was also resolved that another special meeting be held on Monday, the 22nd of November, to resume consideration of that resolution.

The Dumfries and Maxwelltown Water Commissioners have resolved, with a view to checking waste, to introduce the system of charging for water consumed for other than domestic purposes, excepting for shop and garden hose, for the former of which 2s. 6d. per annum will be charged, and for the latter 5s.

At a meeting of the Hamilton Water-Works Commissioners, held on Thursday, the public water-rate was fixed at 6d. per 41 of rental, and the domestic rate at 6d. per 41. It was reported by the Works Committee that the quantity of water in store was equal to a supply for 70 days.

Mr. F. Mackison, C.E., Stirling, has just made a report to the Water Commissioners of that town upon a proposed extension of the water supply works. If his most likely proposal is carried out, it will give a supply equal to 232 days for a population of 30,000 inhabitants, allowing 80 gallons per head per day.

Several small fluctuations in prices took place in Glasgow pig iron during the past week. Up to 53s. 11d. cash was paid on Tuesday, and by Friday afternoon there was a decline of 1s. 2d. per ton. A large business was done daily.

The strike amongst the coal miners has collapsed, and it is probable that before many weeks have passed the coal trade will be greatly improved.

NOTTINGHAM CORPORATION GAS SUPPLY.

ANNUAL REPORT AND ACCOUNTS OF THE GAS COMMITTEE.

At the Meeting of the Nottingham Town Council on Monday, the 6th inst., the annual report of the Gas Committee and the accounts of the Gas Department, for the year ended June 30 last, were presented.

The Committee state that from the accounts it will be seen that there is a balance on the profit and loss account of £29,228 14s. 6d. in favour of the Committee. This balance remains at the disposal of the Council for the purposes mentioned in the 7th sub-section of the 36th section of the Nottingham Corporation Gas Act, 1874. The Committee recommended that after payment of £12,500, by order of the Council made on June 17, the sum of £7021 2s. 6d. should be set aside for the extinguishment of 90 gas annuities which have been purchased by the Committee under the powers given to them by the above-named Act, and that the balance, £3705 11s. 11d., should be carried to the credit of the reserve and sinking fund. The Committee further recommended the Council to reduce the price of gas 2d. per 1000 feet from Michaelmas next, being the fourth reduction since the undertaking has been in the hands of the Corporation, thus making the price of gas lower than it has ever been in Nottingham.

The accounts show that there is due on capital account £575, 11s. 9s. 6d., made up as follows:—Annuities, £362,413 2s. 6d.; bonds, mortgages, and loans, £70,555; and debenture stock (including premiums), £138,147 17s. The annuities are of the nominal amount of £50 each. Up to the 6th of May next year, they are of the annual value of £3 2s. 6d.; but after that time, of £3 6s. The other capital bears interest at 4 per cent. The expenditure on capital account to June 30, 1879 (as shown in the JOURNAL, Vol. II., p. 286) was £515,029 14s. 7d. During the past year there was added to this—for new buildings, manufacturing plant, storage works, and other structures connected with manufacture, £38,739 6s. 8d.; for new mains, laying, paving, &c., £7891 14s. 1d.; and for new meters, £1362 1s. 6d.—total, £45,903 2s. 2d., making the total expenditure to June last £564,062 10s. 9d., and leaving the capital balance at £10,453 2s. 9d.

The following is the revenue account for the year ended June 30, 1880:—

Expenditure.	
Coals, including carriage, unloading, &c.	£54,622 15 11
Purifying materials, oil, water, and sundries at works	2,566 12 5
Salaries of engineers, superintendents, and clerks at works	1,823 14 11
Wages and gratuities at works	21,910 13 9
Repairs and maintenance of works and plant, machines, apparatus, tools, materials, and labour	8,902 10 7
	£90,819 7 11
Less old materials sold	273 1 2
	£90,546 6 9
Salaries, &c., of inspectors, clerks, &c., in light office	£6,217 8 10
Repair, maintenance, and renewal of mains, &c.	1,518 11 11
Repairing and renewing meters	1,832 14 6
	9,568 14 8
Lighting and repairing public lamps	231 0 0
Rents and outgoings	163 9 10
Rates and taxes	3,734 0 4
	3,975 6 4
Salaries of clerk to committee, bankers, general manager, and clerks	£1,453 18 4
Collectors	1,163 18 10
Stationery, printing, stamps, &c.	378 1 0
General administrative charges and incidentals	783 5 7
Auditors	50 0 0
	4,229 3 9
Law charges	22 14 11
Parliamentary charges (oppositions)	583 10 3
Bad debts	22 10 1
Sundries	53,016 0 2
Balance	£162,296 13 3

Receipts.	
Sale of gas—	
Private consumption, 2s. 10d., 2s. 9d., and 2s. 8d.	£118,137 11 11
Public lights	5,881 11 11
Rental of meters	5,040 11 11
	£129,059 13 10
Residual products—	
Coal and breeze, less labour and carriage	£11,756 3 7
Gas	1,927 14 1
Ammoniacal liquor	5,109 18 0
Refuse fire and other purifying material	482 6 5
	30,322 2 1
Sundries—	
Meters, service-pipes, brasswork, and materials of distribution	1,924 0 5
Fines and penalties	2 0 0
Rents	747 15 8
Sundries	241 1 8
	£162,296 13 3

The above amount of £53,016 0s. 2d. carried to profit and loss (net revenue) account is disposed of as follows:—

Interest on loans	£2,830 5 7
debenture stock	2,059 4 0
	22,156 16 2
Amount voted by Council towards expense of lowering Carlton Hill	100 0 0
Balance	23,235 14 5
	£53,016 0 2

The reserve-fund account stands as follows:—

Balance brought from last account	£43,487	9	1
“ of profits, June 30, 1879, £14,567 10 1			
Less amount voted by Council in relief of district-rate	6,000	0	0
Interest on amount invested	8,957	10	1
	1,899	14	7
	£54,344	13	9

The two following tables refer to the coals carbonized and the residual products produced during the past year:—

Statement of Coals.

Description of Coals.	In Store, June 30, 1879.	Received during Year.	Carbonized, or Used during Year.	In Store, June 30, 1880.
	Tons.	Tons.	Tons.	Tons.
Common	5131	99,297	96,318	14,886
Cannel	103	7,881	7,803	134

Statement of Residual Products.

Description of Residuals.	In store, June 30, 1879 (estimated).	Made during Year (estimated).	Used in Manufacture during Year (estimated).	Sold, &c., during Year.	In Store, June 30, 1880 (estimated).
Coke and breeze	2,181	69,096	25,706	36,679	292
Tar	206,110	1,247,846	1,060,940	1,265,940	186,916
Ammoniacal liquor	223,654	1,744,369	—	1,675,574	201,349

At the meeting of the Town Council above referred to—the Mayor (Sir J. Oldknow) in the chair,

Alderman THACKRAY moved the adoption of the foregoing report and accounts. In doing so he said it was a very agreeable task to move the adoption of the Gas Committee's report on this occasion, because they handed over to the Town Council between £23,000 and £24,000, £12,500 of which had been already appropriated, and £7021 was to go towards extinguishing gas annuities, while the remaining £3706 would be added to the reserve-fund. The Committee further recommended that the price of gas should be reduced 2d. per 1000 cubic feet. He thought he might safely say that he did not think the proposed reduction would affect the balance for next year, as the great increase that had been going on with regard to gas consumption was extraordinary; and as the Committee were now able to purchase coal on favourable terms, the cost of gas was justified in saying that the balance next year would not be less than it was at present. He therefore thought the gas consumers were entitled to a fair reduction in the price of their gas. Looking, as he had done from time to time, at the reports of the various gas companies throughout the kingdom, he had found there had been a reduction in the price; and it was perfectly clear to him that the principle of taxing the consumers to relieve the rates could not stand; it must break down. He maintained that its inequity could not be sustained, because a reason must be shown why the gas consumer was taxed; and he could not see any reason. It was unjust. The fact that there were now 61,600 gas meters in Nottingham showed that gas was very generally consumed. To show how successfully the gas-works had been managed during the six years they had been under the Corporation control, he need only mention that the profits which would have been in the hands of the Gas Company would have amounted to £90,500. The cost of gas was now, upon the whole, 5½ per cent.—just what it was in the time of the old Corporation. Of course, every year, as the Gas Committee expended more money, which they would be compelled to do, that rate would be reduced. The balance of £3706 which they proposed to add to the reserve-fund, brought that fund up to £125,000. It was a very important matter that they should be annually increasing their reserve, for that they might make themselves always secure in case of accident; for, looking at what had recently happened in London, it was well to be prepared for anything of the sort. Altogether, the profit on the year amounted to £23,326, which was the interest on the reserve-fund added, would make a sum of £57,225. He thought the Council would find that the management of the gas-works was satisfactory. The Managers tried to do the best they possibly could; and, as regarded Mr. Wilson, the Committee could, as heretofore, speak most favourably. Mr. Wilson was very attentive to his duties, and no man was better up in the matter of gas production. Mr. Tarbolet, the Borough Engineer, had been carrying out large works at Radford, and when these were completed they would be as well finished as the other two stations. Altogether, the report was a most favourable one, and one which he trusted the Council would support.

Alderman HOWITT seconded the motion.

Mr. BAINEs asked why the accounts had not been audited by the Borough Auditors this year.

Alderman THACKRAY said the matter lay within the discretion of the Gas Committee, and they were not obliged to call in the Borough Auditors.

Mr. BAINEs said he thought the accounts should be referred back to the Committee to have them audited in the same manner as last year, as not having them audited in a proper way gave the town an impression that something was wrong. He congratulated the Committee that they had reduced the price of gas for two years 3d. per 1000 feet, and by so doing had increased the rate of the reserve fund to £10,000. The reserve fund was now £58,000, and he should like to know how that fund was invested. It seemed to him rather curious to borrow £40,000 a year and have £58,000 in the reserve-fund. It was almost a mistake in an undertaking like this to have a reserve-fund. The Nottingham gas supply was the Corporation's undertaking, and the better way would be to buy out the annuities. He noticed that last year there were bad debts to the amount of £598, and this seemed strange when they considered the enormous powers the Gas Committee had. He was sure every member of the Corporation would be sorry for the report to be referred back to the Committee, but, as a matter of duty to the town, he thought it ought to be audited and signed in the usual way, and they would move an amendment to that effect.

Mr. JACOBY seconded the amendment, as he questioned whether the report could legally be adopted unless it was signed and the accounts were passed by the Borough Auditors. It was, he thought, satisfactory to know that there was to be a reduction in the price of gas.

Mr. GREGORY, in supporting the amendment, said he was afraid the accounts would not be properly audited until the Corporation had a Government Auditor. He was opposed entirely to the reduction in the price of gas. For many years the town had been put to very great expense in opposing the Gas Company, and only a few years back it had been stated that the towns had better not buy up the gas companies' works, as something would be introduced to supersede gas. If such were the

case, who would have to bear the loss? The ratepayers of the town; and he maintained that it was to the interest of large consumers of gas that the price should be reduced, but in an undertaking of this kind some profit should, he thought, go to the town.

Alderman HOWITT said, in answer to Mr. Gregory's observations, he considered the profit received from the gas an undertaking simply recouped them for all it had ever cost the borough previously. As regarded the amendment, he did not know what was to be gained by it. He thought it would be more dignified for the Council to pass the accounts this time, and afterwards pass any resolution they liked to make for the future; but to refer the accounts back simply because they had not been audited by the Borough Auditors implied a want of confidence in the Gas Committee.

Mr. BENTLEY said the question put by Mr. Baines had not been answered, and he considered that until they had an answer to that question all the discussion would have to be gone over again. He deemed it to be only right that the Borough Auditors should audit these accounts, and they should be brought in a clear, straightforward way before the Council. With regard to the question of reduction of price, there were two sides to it. When coal was high in price, the price of gas was high; and, of course, there should be a reduction in the latter when the cost of coal was less; but they had no right to bring the price so low as to give the large consumers all the benefit. He wished to know whether it was legal to pass the accounts without the signature of the Auditors.

The TOWN CLERK said the accounts as now presented were strictly in legal form. The Town Council could order them to be audited by any one they pleased. The Borough Auditors had no power in the case unless by order of the Council.

Alderman GILPIN said he should oppose the report being referred back, because even those who wished it to be sent back were satisfied. Mr. Baines said he knew the accounts were perfectly correct, therefore it would be putting the town to the expense of auditing and causing unnecessary delay in the accounts to the Borough Auditors.

Mr. ROBINSON regarded referring the report back as not only just to the ratepayers, but as likely to remove any doubt as to the nature of the accounts of the Council.

Alderman THACKRAY said the Gas Committee had no objection to the Council auditors' accounts to be examined by the Borough Auditors, but the Committee would still have to continue the services of their own Auditor. The accounts were very intricate, and he was thoroughly conversant with them.

The amendment was then put, and lost by 29 votes to 16.

Alderman BAINEs then moved that the price of gas be reduced 2d. per 1000 cubic feet.

Alderman FOSTER seconded the motion.

Mr. LINDLEY said he had a few reasons to give for opposing the reduction. The Council were told a short time ago that, owing to the price put upon coal, they had to reduce the price of gas, and that was not good. And the only way to protect themselves was not to charge too low a price for the gas. They distributed gas over an area several times larger than that of the borough, and while it was their duty to supply good gas, they ought to take care to make it subserve the interests of the ratepayers of the borough. The Gas Committee had to consider the interests of the ratepayers, and if there were any loss they would have to bear it, while the consumers beyond the boundary of the borough would have nothing to fear. The Council were charging what he conceived to be a very low price for gas. They took it nearly to Bingham, and the maximum price charged was 2s. 10d. A simple further than they could do at Bingham, a small market town, and the inhabitants supplied their own gas at 5s., and there was no means of testing the quality. In another direction they went almost to Southwell, and at Southwell the price was 5s. Then, again, they went nearly to Long Eaton, where the minimum was 3s. 9d., and the illuminating power 16 candles. At Mansfield, on the way to which they went as far as Amosley, the price was 4s. down to 3s. 8d., and at Newark 3s. 6d., with a quality of 14 candles. At Sutton-in-Ashfield it was 4s. 7d. down to 3s. 5d., and the quality was 17 candles. Then if they compared their prices with those of large towns in the neighbourhood, they were still as low as any. At Derby the price was 3s. and the quality 16 candles. At Leicester, the price was 4s. 6d., and the quality 16 candles. At the Midland Railway, 3s. 6d.; to other consumers, 2s. 8d.; and the quality was 16 candles. At Loughborough the price was 4s. 1d., and the quality 14 candles. He thought the Council would act far very unwise in reducing the price below its present amount. They suffered so much loss in standing the price of gas at the present rates, that if they reduced the price the charge would be great folly. He would move, as an amendment, that the price be not reduced.

Mr. WILSON said they seemed to have lost sight of the fact that gas entered very largely into the production of local manufacturers, and it was unfair and unjust to make manufacturers pay the cost of the gas. If they taxed the industries of the town, they were doing something to take them away, and place them in other towns where there were greater advantages.

Mr. ROBINSON thought Mr. Lindley's argument ought to show sufficiently that the Council behaved fairly to manufacturers, and to reduce the gas would be a gross injustice to the ratepayers. He could not think for one moment that £23,000 was any great amount of money to take out of a concern in which they had something like £564,000. Then as to what they had to meet, they could only come to one conclusion—that the electric light was "looming in the distance," with a probability of being used in one form or another. They could not but see that if they ought to place something more than £3000 a year to the reserve-fund.

Alderman BARBER was very much surprised that mercantile men should look at the reduction in the price of gas in the light that some of the gentlemen in the Council viewed it. He thought the price of gas was a good deal lower than it was some years ago, and that the consumption as the price was lowered. The same thing would apply to gas. The lower the price the greater in proportion would be the consumption and the profit. His idea was that one-third of the profit should go to the reserve-fund, one third to the rates, and one-third to the reduction in the price. He trusted this reduction would be sanctioned. It would be very much to the advantage of the ratepayer as well as the consumer.

Alderman GOLDSCHMIDT said in small places where the consumption of gas was not great the cost of the production was enhanced. Hence also if they were to raise the price to 4s. or 5s. per 1000 feet, the consumption would be diminished, and the higher price would be legitimate. But if the consumption was increasing it would be simply folly to put on a tax of 7 or 7½ per cent. in favour of the small consumer. The difference between 2s. 6d. and 2s. 8d. was of great importance to large consumers, and proportionately less to small consumers. Mr. Robinson lost sight of the fact that the price of gas was not only a matter of interest, but on the return, and he maintained that if they could make 50 per cent. clear on return, after deducting interest on capital and wear and tear of plant, they would be well satisfied. As for the electric light, that, he was happy to say, was looming a long way in the distance, and it would not be long before it would be introduced for domestic illumination. He thought the profit on the sale of gas should largely contribute to reducing the rates, and when the reserve-fund reached £100,000 they ought to contribute more than a third or a half to such reduction.

Mr. CROPPER, though a member of the Gas Committee, opposed the reduction in the price of gas. Alderman Barlow said that if they reduced the price there would be an increased consumption, and he drew this inference—that increased consumption meant increased profit. Now his inference was that if they gave the gas away altogether they would have an immense profit. To his (Mr. Cropper's) thinking, a more equitable way would be to make a difference between the minimum and the maximum price. Mr. Wilson said that gas entered largely into the local manufactures. If so, why not reduce the price for manufacturing purposes, instead of reducing it to all consumers? Suppose they made a difference of 15 per cent. in this respect, it would still leave a large balance. Every ratepayer in the town felt the advantage either in a monetary way or from improvements. In Leeds they had the lowest gas-rate in the country, and there were three other towns where it was lower than in Nottingham. These were Burnley, Carlisle, and Middlesbrough. What was the moral to be drawn from this? He would give them Nottingham first. The gas charge there was 100 per 1000 feet, the rate was 4s. 2d., and the debt per head of the population was £2 12s. At Middlesbrough there was a lower gas charge; the rate was 7s. 3d., and the debt £4 14s. per head. At Carlisle there was a lower gas charge, the rate was 5s. 6d., and the debt £3 8s. per head. At Burnley the gas charge was 2s. 6d. per 1000 feet, the rate was 5s. 6d., and the debt £3 2s. per head; and when they came to Leeds they found the gas charge 1s. 10d. per 1000, and the population rated at 6s. 10d., and the debt per head £11 10s. The practical question was this—Was the reduction going to lead to a higher debt? If so, the Council should deal with it by rejecting the motion. Alderman Grimshaw said that the reduction in price, which to his mind, was justified by the profit made. Previous reductions had been followed both by an increase of consumption and an increase of profit. He thought if the price were reduced there would be a greater consumption of gas for domestic purposes.

Mr. Cropper opposed the reduction. When they had a reserve-fund of £100,000 and began to reduce the price it would be business-like, but until then it would not.

Alderman HOWITT gave some statistics as to the reductions which had already been made in the price of gas, commencing with 1874, when the rate was 1000 feet was 3s. 10d. and 3s. 4d., when there was a profit of £5000, and ending with 1880, when the rate was 2s. 6d. per 1000, and they made £12,526. On this calculation he urged that the reduction was justifiable.

Mr. BENTLEY said he remembered the agitation in the town before the gas-works were taken over by the Corporation, and the inducement held out to the voters to accept a reduction in the rate, if the works passed into the hands of the Corporation they would have cheap and good gas. This argument alone strengthened the hands of the Corporation, or they never would have had the works up to the present time. It would appear that there were two constructions which might be put upon what was now proposed to be done by the Corporation, the price of gas per 1000 feet being reduced to 2s. 6d. per 1000 feet. The first construction was that the consumers would get the benefit more directly. The second construction was not likely to cause them any serious trouble, or supersede gas at present, so that there was no very pressing necessity for a large sinking-fund, and he thought that while coal was cheap the gas should be made as cheap as the coal could be.

Alderman THACKERAY in reply, observed that it had been said that gas might be superseded by the electric light, and that therefore the Corporation should levy an extra charge upon the gas consumer. He would have no objection to this if the money were to go to a reserve-fund, but what was proposed by those who wished to reduce the rates, and to accumulate a fund with which to extinguish the old capital of the Gas Company, was an unfair tax on the gas consumer to relieve the rates, and to accumulate a fund with which to extinguish the old capital of the Gas Company, what would be sound policy. No one in the course of the discussion had shown him any ground upon which they ought to levy a higher rate upon the gas consumer, or to meet contingencies, for if the use of gas was abolished, who would have to bear the burden of the gas rates, the consumers? Making large profits out of gas was an indirect source of taxation, and he was much surprised that a Liberal Council should promote indirect taxation. If they wanted to levy rates, let them do it boldly and honestly. He had been told by Alderman Goldschmidt that he had done an injury by speaking in this way, and that he was doing the right principle when it made gas as good as coal. Possibly so, but he supplied it upon the net terms to the consumer. That was doing perfectly right, and what would be the result for Leeds? The increased consumption of gas there would be something enormous in consequence of the low price charged, because gas was being used more and more every day, not so much for illuminating purposes as for domestic purposes. He had read the reports of the meetings of the various associations of gas engineers, and found that Mr. C. Hunt, presiding at one of them, explained that towns where the gas companies demanded a guarantee and deposit the consumption of oil was abnormally large, but that liberality, combined with caution, was certain to meet a fall reward, not only in the shape of assured profit, but also in the approbation of the consumers. He might say that Alderman Riley, Chairman of the Halifax Gas Committee, said at one of those meetings that a gratifying result was in the air, and that the gas companies of the Halifax Gas-works, leading to a substantial reduction in the price of gas, might shortly be looked for. He (Alderman Thackeray) believed that Manchester had done a great deal of mischief by the way it had taken money out of the gas concern to relieve the rates. He thought the Council should be more liberal in the way the gas consumers were treated, and that the matters would get abroad, and the consumers would be satisfied if nothing were done; and they could not help it if they found that they were not only paying a full district rate, but, beyond that, had to contend with an increased price of gas. The gas consumers supplied by the Council with the means to purchase and work the concern, and the Corporation ought to serve them with the gas at the most reasonable terms. The price of coal was a most important element in the price of gas, and if the consumers of gas a few years ago had to pay a very high price because coal was dear, it was only right that when coal was cheap there should be a corresponding reduction in the price of gas; and in spite of this he dared guarantee that next year there would be a large saving, and even at this time and in this summer weather there was a consumption of 1 million cubic feet per week.

The motion was then put and carried, and the Council passed to other business.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

In both the coal and iron trades of this district, business continues very dull. The present position of the market may be described as one of stagnation. The proprietors are beginning to look forward to the approach of winter as one means of relieving the present depression, and iron producers are rather waiting the working out of consumers stocks than forcing new sales at present.

In the coal trade prices generally continue extremely low, and although there is some hope that next month may see some upward movement in values, there is still a great deal of pressure to sell. Shipments of coal

have been rather better during the past fortnight, but this has been only to a very moderate extent on the whole, and its other respects colliery proprietors experience no materially increased demand. Both best and common round coals are bad to sell, and average from 4s. 6d. to 5s. for steam and forge qualities, up to 7s. and 7s. 6d. per ton at the pit for good house-fire coals, with sellers at all kinds of prices between these figures. Export trade is probably steady, good burly fetching 4s. to 4s. 3d., and good slack 3s. 3d. to 3s. 6d. per ton at the pit; but there are common sorts to be bought at much lower figures.

Coke is without material change, the demand being still very small and prices low.

Business at trade makers of pig iron are chiefly engaged with deliveries of iron for the export trade, and few new orders have been booked at present on account of old contracts, very few new orders have been booked at present. For delivery into the Manchester district, 49s. to 50s. per ton, less 2½ per cent., is the average price for Lancashire pig iron, and Lincolnshire and Derbyshire brands can be bought at the same figure, in some cases a trifle under. Bar iron makers are fairly busy, and local brands delivered into the Manchester district are steady at about 42s. 6d. to 45s. 6d. per ton.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

A steady increase in the output of coal is one of the most favourable indications of the better state of trade in this district. The class referred to, however, is more particularly such qualities as are used by the local pig iron makers and finished iron manufacturers. The demand for best quality of iron for household purposes is also good, and the business of the Cannock Chase district, where trade has been of a more favourable character throughout the past quarter, a better tone prevails, and at most of the collieries a fair tonnage for export and transit is being raised. Contract inquiries are, however, very scarce, and indications point to the probability that the great majority of the summer and autumn contracts have been satisfactorily arranged. An average share is believed to have been placed in the South Staffordshire district, though the quotations returned are of an extremely low rate on the whole. In a few instances prices have been given which, even at the present low rate of remuneration paid for raising, will scarcely cover cost. Good quantities of coals are plentiful, but only a limited inquiry exists. Furnace fuel and coke are in demand, and are receiving a better call, and the market on the whole may be said to be steadily improving.

The iron trade maintains a more active existence than is usual at the end of the quarter. In most departments of both the finished and raw iron, there is a steady demand, and the business of good quality of iron by several houses for various descriptions of finished iron for the foreign market, more particularly for girder plates, hoops, rods, and strips. Bars of both best and second-class qualities are receiving better attention for export account. From Australia, the States, India, and the Cape, inquiries are reported by some of the leading houses. The local pig makers are steadily engaged, though no noteworthy increase in the number of furnaces in blast is returned. Part mine is selling fairly well at £3, whilst hot air is not receiving much attention; a few parcels of the latter changed hands during the week at prices averaging £3 10s. to £3 15s. Coal pig iron is selling at 42s. 6d. to 45s. 6d. per ton. The output of the district per week than was reported at any period during the last quarter, though few only are fully employed. In the other miscellaneous branches of industry things are looking favourable, and show signs of a steady improvement.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The West Yorkshire coal trade exhibits no improvement, many of the pits still making an average of about three days per week. There is a very fair tonnage of steam coal forwarded to Hull and Goole, but from several places there was a decrease as compared with the month of July. A few of the pits in the district are doing a fair business, but the demand for coal for London, but the local trade is only quiet. A fair quantity of coal is being raised, which is for the most part supplied to local gas companies at prices similar to those which have been current during the past few months. At several collieries reductions are being demanded, whilst at the Knapthorpe Colliery an amicable arrangement has been come to respecting the wage question.

The South Yorkshire coal trade continues in a very unsatisfactory state, the wages question giving rise to a good deal of anxiety. The Silkestone miners employed have left work at the Wharfedale Silkestone Colliery, but the Parkgate men are at work, and the Silkestone men are at work. The demand for house coal for London is only quiet, but considering the short time worked a pretty good tonnage is being sent over the Midland and Great Northern lines. Most other markets exhibit a remarkably quiet tone for this season of the year, when merchants are generally inclined to stock coal for winter. The collieries vary a great deal; in fact, more so than for years past. The Manvers Main Colliery, where 900 men and boys are employed, are making almost full time. The same may be said with respect to the Denaby Main Colliery near Mexborough, where about 1300 tons of coal per day is being raised. These and a few other pits are exceptions to the rule, as most of the pits are not making more than three or four days per week.

There is a very fair business doing in steam coal for Grimsby, some of the leading merchants shipping there being shareholders in local collieries. The quantity sent to Hull, although not so large as it was, is good. Denaby Main last month forwarded the largest tonnage of any Yorkshire colliery, having sent 11,792 tons, and the Silkestone Colliery sent 11,000 tons. The Silkestone Colliery did very well, considering the competition which has to be met.

Those pits which raise a good quality of gas coal are enjoying a fair share of patronage. The Silkestone collieries are doing better than some of the thick-steam pits, owing to the coal yielding more gas, and being supplied at a cheaper rate than was the case a few years ago. A fair tonnage is being sent to Nottingham and other places in the Midlands, as well as to the Eastern Counties.

Other kinds of fuel, including small coal and slack for manufacturing purposes, are only in moderate request, and prices are not so high as in the summer. The coke trade holds pretty well up; but neither the demand nor the output is so large as it was. There is rather a falling-off in the tonnage sent to North Lincolnshire, where 14 out of the 20 erected stacks are in blast. Within the past few days there has been a rumour in circulation that the Midland Railway Company are about to make a reduction of 1s. per ton on coke sent to Blackwall for steamer purposes, and this has somewhat checked sales, it being believed that if a concession is made it will become pretty general.

The labour market, as before intimated, is much disturbed. The Barrow collieries have arranged their dispute, but those employed at the Midland Railway are still out. In view of securing greater unity of the men, a conference of representatives from Yorkshire miners lodges is fixed to be held at Barnsley to-day (Tuesday), when the delegates will be asked to consider "the best and surest means of preventing reductions" as well as "the present position and prospects of South Yorkshire miners."

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The public of the North have been a good deal excited over the frightful catastrophe that has occurred in the gas colliery at Seaham. It is a large pit, and the coals shipped have generally been placed on board small sailing vessels at Seaton Harbour for the gas-works in the bye-ports. It will be a long while before work is resumed there.

The general gas coal trade continues active. The demand is very well sustained, and the shipments are considerable. Sailing ships were inquired after in the latter part of last week to take coals to Ireland at an improvement of about 6d. per ton on freight. There are no reports of any contracts having been made for the ensuing season, so far. It is not probable, as I have previously reported, that the coalowners will secure much advance in prices. There are too many coals in the market for that, and second-class pits keep rather scant of work. The house coal trade is a little better, as we begin to draw towards the cold weather. Steam coals are in moderate request. The coal offices in this trade have a great difficulty in maintaining prices as they are, without seeking an advance. Coke is being shipped pretty freely to the Baltic, mostly on account of the contractors, however, who have to complete their transactions before the close of the season. Freight for Grimsby advanced 6d. to 9d. per ton last week, on account of the inquiry for boats for this purpose.

The general trade of the North of England last week was very little changed from the previous week. A fair quantity of goods are sent abroad, and are also bought, but the home market is complacent. It is universal amongst manufacturers that the competition is so keen in the market that they have the greatest difficulty in realizing a profit on their transactions. The iron trade is moderate, especially manufacturing. The chemical business keeps very dull. Prices were a shade lower last week.

SALE OF GAS SHARES AND BONDS AT GREAT YARMOUTH.—Last Thursday evening Messrs. Sturges and Son sold 54,000 shares in the Great Yarmouth Gas Company, which realized an average of 412 10s. per share; 40,430 shares in the same Company realized an average of 445 s. per share; and 6 bonds of £50 each in the Gorleston and Southtown Gaslight and Coke Company sold for 451 per bond.

EXPLOSION OF A GASOLINE APPARATUS IN BERLIN.—A gas-making apparatus exploded in a Berlin *Bierhalle* on the 5th ult., in consequence of a leak which permitted the escape of the gas. The apparatus had only been in use a fortnight previous to the explosion, and the escaped fluid ignited in consequence of the inattention of an attendant who was not aware of the explosive nature of the gasoline. Four men were killed, and eight others badly injured by the explosion.

HARLEPOOL GAS AND WATER COMPANY.—The annual general meeting of this Company was held on the 31st ult.—Mr. T. B. Holmes in the chair. The Directors report which was presented was taken as read, and the Chairman, in moving its adoption, congratulated the Shareholders generally on the favourable position of the Company. The dividend was, perhaps, not so large as some of them could have wished; but, under existing circumstances, the Directors considered it was not judiciously recommend. The new gasholder was finished, and the purifying and storage capacity had been made equal to about three-quarters of a million cubic feet of gas per day. The report was adopted, a dividend of 61 per cent. declared, and the retiring Directors and Auditor were re-elected. The balance sheet was moved, and was found satisfactory, for his services to the Company, and acknowledged by him, and the proceedings then closed. It may be mentioned that the total quantity of water sold by the Company during last year was 425,978,900 gallons, an increase of 33,839,700 gallons as compared with the consumption ten years back. The consumption of gas (N.Z.) was 102,916,900 cubic feet, and in 1870 it was 68,420,200 feet.

THE GAS SUPPLY OF DUNEDIN (N.Z.).—Extensive additions and improvements to the Dunedin Gas-Works which are contemplated, and a portion of which are in course of construction, will, we learn, fully meet the requirements of the city for some years. The quantity of gas now required for Dunedin is estimated to be 120 million cubic feet, and the gas now being supplied is 1872. In the year mentioned the quantity manufactured was 12 million cubic feet, and this year it will be between 65 million and 75 million cubic feet, which will be about the maximum production of the present retort-house. To meet, therefore, an anticipated increase in the consumption, a provision of 100 million cubic feet of gas will be required during the summer. This addition when completed will be 120 feet in width between the walls, and will be covered with a three-span roof. The retort-benches will occupy the central portion of this house, and will be covered by a span of 60 feet, while the two outer spans of 30 feet each will cover the coal stores, &c. Though each shed the coal will be run on an elevated railway, and by this means a considerable saving will be effected in the cost of discharging. Through retorts will be used; they will be 20 feet in length, and will be charged from each side of the benches.

WINCHESTER GAS AND WATER COMPANY.—The half-yearly general meeting of this Company was held on the 26th ult., when the Directors report on the operations of the Company for the past half year was presented. The Chairman, Mr. W. Statter, Esq., J.P., in the chair, and the working account showed a balance of £2613 17s. 11d. The Directors recommended that a dividend of 10 per cent. per annum be declared for the half year, less income-tax, and that £500 be placed to the reserve account, which would then amount to £3436 18s. 10d. The Directors added that the great gasholder had been put up by the new shareholder and tank, and that the whole of the work was near completion. An extraordinary meeting of the Shareholders was also held for the purpose of receiving the Directors report on the subject of authorizing the raising of additional capital. This report stated that the consequence of the retort-outlay in the construction of the new gasholder and tank, they recommended that the 450 shares, being the remainder of the capital authorized by the Company's Act not yet called up, should be issued to the Shareholders as far as possible *pro rata*, and that a call of 45 s. per share should be made payable on the 1st of October next.

POWELLTOWN WATER-WORKS COMPANY.—The accounts of this Company for the half year ended June 30 last show the expenditure on capital account during the six months to have been £77 8s. 6d., thus increasing the grand total to £3792 11s. 7d. Received, £203; making the whole receipts since the account £36,290 12s., and leaving a balance on this side of the account of £2638 15s. 7d. In the revenue account the expenditure was £1316 14s. 9d., against £1037 9s. 6d. in the preceding half year. The increase was principally to be attributed to the repairs and maintenance of mains, which cost £275 0s. 5d. in the last half year, against £35 4s. 3d. in the previous half. Service-pipes, the figures respecting which were £28 2s. 8d. in the first half of 1880, cost £10 9s. in the second half of 1879; £472 0s. 1d. was the net revenue account against £476 6s. 5d. in the previous half year. The water-rates for the June half year, on the other hand, amounted to £917 9s. 4d., against £839 17s. 7d. in the December half, and the receipts for service in 1880 were £361 0s. 6d.,

against £197 11s. 11d. The stores in hand were £278 9s. 5d., and sundry debtors owed £489 9s. 3d. The other important figures to be noted are—balance of net revenue account, £730 11s. 11d.; due to London and Provincial Bank, £258 6s. 6d.; unpaid dividends, £54 0s. 9d.; sundry creditors, £3295 9s. 7d.

BIRKENHEAD GAS AND WATER SUPPLY.—At the last monthly meeting of the Birkenhead Town Council the Deputy-Mayor (Mr. T. S. Jackson) in the chair—a report was read from a Special Sub-Committee of the Gas and Water Committee, appointed to consider and report upon a resolution of the Parliamentary Committee with reference to the division of the capital of the gas and water undertaking into the sums belonging respectively to gas and water; the appropriation of the surplus income in reduction of local rates, and especially in reduction of the price of gas and water; the taking over of the Tramway Water-Works and proposed extension as part of the supply of the borough; and with regard to additional borrowing powers, regulations, &c. The Special Committee recommended, amongst other things, the amalgamation of the Tramway with the Birkenhead and Cloughton Water-Works, a further extension of works for water supply, further extensions of gas-works, and the acquisition of powers "to manufacture and supply within the district electric light or any other illuminant than gas which may come into general use, and which may supersede gas, either for public or private lighting; and to supply gas in the district of Newton and water in the township of Bidston." After a short discussion the Council approved the report, and agreed to refer it to the Parliamentary Committee.

REDUCTION IN THE PRICE OF GAS BY THE ROSENDALE UNION GAS COMPANY.—On Thursday, the 2nd inst., a deputation, consisting of representatives of the Local Authorities and others supplied by the Rosendale Union Gas Company, waited upon the Directors, to present a numerous memorial signed by the principal gas consumers in the district, soliciting them to take into consideration the present high charges made by the Company for gas—4s. 5d. per 1000 cubic feet—and asking for a substantial reduction. The Chairman of the Company (Captain Aitken) said the Directors were of opinion, from the returns which they had received from other Companies of a similar character, that the price of the gas charged in their district were not really higher than in others, and with reference to the charges made to the public bodies for the lighting of the lamps, the Company could not possibly reduce them. He referred to the large capital the Company had invested, and said that in consequence of the depreciation of the value of the property, and the consequent difficulties, they had experienced great difficulties. The deputation, who were very courteously received, were afterwards informed that the Directors had decided to reduce the price to general consumers 3d. per 1000 feet, but could not possibly reduce the price charged to public bodies for public lighting. The deputation thanked the Directors and retired.

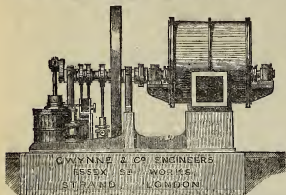
FARNWORTH AND KERSLEY GAS COMPANY.—The half-yearly meeting of this Company was held on the 25th ult.—W. Statter, Esq., J.P., in the chair. The Directors, which was then presented, it appeared that the cost of the manufacture of gas and its distribution had, during the six months ended the 30th of June last, been £2541 5s. 5d.; in rents, rates, and taxes there had been expended £277 9s. 11d.; the management expenses were £331 10s. 1d.; depreciation of buildings, plant, &c., £769 3s. 4d.; and bank interest and compensation, £8 12s. 6d.; leaving a balance to be carried to profit and loss account of £2851 6s. 5d. For the sale of gas and rental of meters there had been received during the half year, £5865 17s. 11d.; for residual products, £806 6s. 11d.; rents of coal gas, £48 10s. 8d.; and for meters and other work, £475 5s. 1d. The profit and loss account showed a balance of net profit to be carried to next account, subject to six months dividends to the 30th of June last, of £5177 9s. 3d. The expenditure up to the end of last year was given at £61,532 18s. 4d., and from this was deducted £4769 3s. 4d., depreciation of the same period £120 14s. 8d., had been spent upon plant and new buildings, the expenditure thus being £60,884 7s. 8d., which was returned as £61,560, an addition of £615 12s. 4d. being made as balance of capital account. The balance in the hands of the bankers, according to the general balance-sheet, was £1926 19s. 4d.

THE LIGHTING OF COURTS IN LIVERPOOL.—At the last meeting of the Liverpool Town Council, Mr. H. W. Statter, Esq., J.P., in the chair, after recommending of the Watch Committee:—"That the lighting of the courts in the parish of Liverpool be at once proceeded with, and that the cost (including that of the lamps and other requisite apparatus) be provided from the same source as that from which the cost of the public lighting of the city is now provided." The Committee, after some discussion, agreed to the resolution, and it was positively dangerous for the police to go into them when a disturbance occurred. As the lighting was for the public benefit, it was only right that the cost should be defrayed out of the same source as that which provided for the lighting of the streets. Mr. Holt seconded the motion. A memorial was read from the Lamps and House Owners Association protesting against the expenditure of £15,800 in affixing the lamps for the lighting of 2500 courts. Dr. Comins, M.P., did not see the advantage to be gained by expending £15,000, and said that in the course of 20 years experience he had never known a single instance where the lighting of courts prevented any disturbance. Some further discussion followed, and the Council accepted the recommendation of the Committee in the following amended form:—"That the lighting of the courts in the city of Liverpool be at once proceeded with; that the cost be provided from the same source as that from which the cost of the public lighting of the city is now provided; and that the cost of the work be given to the owners of those courts which are reported by the City Engineer as being most in need of light."

NORMANTON GAS COMPANY.—The half-yearly general meeting of this Company was held on the 21st ult.—W. Statter, Esq., J.P., in the chair. The Secretary (Mr. Armitage) having read the notice of meeting, the Chairman, Mr. H. W. Statter, Esq., J.P., in the chair, read the report to present to the Shareholders as last half year. The works were in good order, but the mains were faulty, and the leakage was consequently high—25 per cent. The total income of the Company for the half year was less than for the previous half year, and this had been owing to the Company having made some concessions in order to secure a new contract with the Midland Railway Company. He then went through the accounts in detail, pointing out that the income had been £900 less than usual, and that the Company had had to pay £50 more for repairs. The illuminating power of the gas had been kept up to nearly 18 candles, and the cost had been £41,000 per annum, but the profit on the year would allow of the payment of a dividend of 6 per cent. The Directors thought, however, that with their large reserve-fund of £1099, they might declare a dividend of 7 per cent., by taking £167 from that fund, and this would leave £932 still in reserve. He therefore proposed that a dividend of 7 per cent. be declared, and that the same be paid in the form of a bonus, and the motion, and it was carried. The retiring Directors, Messrs. Walker and Lodge, were re-appointed, and the proceedings terminated with a vote of thanks to the Directors.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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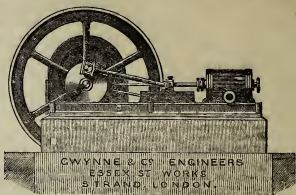
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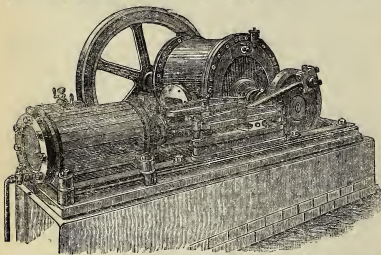
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52,500 EXHAUSTER, with Horizontal Engine combined.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS, WITH Wrought-Iron Spindles and ENGINES COMBINED.



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MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

(SEE ALSO ADVERTISEMENT, PAGE 438.)

Phoenix Engineering Works:

HOLLAND STREET, SOUTH WARK, S.E.

WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAONIE GREEN, Assoc. M.I.C.E., Gas-Works, SYDENHAM.

WANTED, Masonic Votes on behalf of a child of the late Bro. William Clark Watson, who was a Subscribing Member of the "Frederick Lodge of Unity," No. 452, a Member of the British Association of Gas Managers, and late of Kingston-on-Thames. Votes thankfully received by Bro. MAONIE GREEN, Lower Sydenham, Kent, S.E.

WANTED, a Situation as Gas-Fitter. Is used to Service-Laying, Compo Fitting, Meter Fixing and Indicating, and Repairing Street Lamps. Apply, stating wages, to Mr. BATTER, BARCON.

WANTED, a Situation as Engineer or WORKING FOREMAN of a small Water-Works. Understands Pump Work, Main and Service Laying, &c. Good references. Address SAMUEL DENTON, 48, Seymour Street, St. John's, DEPTFORD.

WANTED—The Advertiser, a Young Man, aged 29, married, is open for an Engagement as MANAGER and SECRETARY of a medium-sized Gas-Works, or SUB-MANAGER of a large Works. Has a thorough knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Gas-Works for 16 years. Highest testimonials and references. Address No. 678, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED immediately, a Steady Man as STOKER. Constant employment to a good man. Apply to the MANAGER, Gas-Works, Briton Ferry, SOUTH WALES.

WANTED, by a Young Man, a Situation in a Gas Company's Office. Understands the general routine. Neat writer. Excellent character. Wages moderate. Address No. 680, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Young Man to Assist in Gas-Works. Wages 21s. per week. For particulars, apply to Mr. JACKSON, Manager, Gas-Works, Spillaby, LINCOLNSHIRE.

TISBURY GAS AND COAL COMPANY. **WANTED, by the above Company, a** WORKING MAN capable of Making Gas, Laying Services, doing Repairs, and attending to Weighing Out and Selling coals, &c. Apply to Mr. H. COLLINS, Gas-Works, Tisbury, WILTS.

TO GAS-WORKS MANAGERS. **WANTED, a Working Manager for** a small Gas-Works in the West of England, where the annual make is about 3 million cubic feet. No one need apply who cannot refer to works he has already successfully managed. State age, number in family, and send copies only of testimonials, extending over the past four years. Wages 25s. per week, with house, coal, and light free. Address No. 601, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Bath Gaslight and Coke Company, a GENERAL FOREMAN, who must possess a thorough practical knowledge of the Manufacture of Gas and the various Apparatus and Machinery used in Gas-Works. Applications, stating age, experience, and wages required, to be addressed to the undersigned not later than Monday, the 20th of September inst., and to enclose three testimonials of recent date.

By order,
C. STAFFORD ELLERY, Engineer.

WANTED at once, by the Shrewsbury Gaslight Company, a thoroughly efficient General FOREMAN, who understands the Manufacture of Gas and the Plant and Machinery connected therewith. None but those whose characters will bear strict investigation need apply.

Applications, in own handwriting, stating age and qualifications, to be sent to the undersigned, and to be accompanied by recent testimonials. A married man without family preferred. Wages 32s. per week, with house, coals, and gas.

By order,
Wm. BARNES, Secretary and Manager.
Gas-Works, Shrewsbury, Aug. 20, 1880.

FOR SALE—In consequence of the decease of Mr. Milne, a GAS-WORKS in a small Manufacturing Town in Ulster. Present make 1½ millions, which might be increased. For particulars apply to ALBERT MILNE and Co., Gas-Works Leicesters and Engineers, 11, Chichester Street, BELFAST.

PLANT FOR SALE. **The Elsecar Gas Company, near Barns-** ley, have FOR SALE the following PLANT (Thorncliffe patterns and make):—
3 Ash-Pans, with 3 furnace-doors, frames, and fire-bars.
11 Mouthpieces, 15 in. by 13 in.
11 Flange and Socket Pipes to fit.
11 Spigot-Pipes.
11 Arch-Pipes for same.
3 lengths Hydraulic Main, one for five retorts, and two for three retorts.
22 Mouthpiece Doors.
11 Door-Servos.
1 Condenser, with tar-box and 16 6-in. pipes.
8 Syphons and Bye-passes.
1 Scrubber, with dry-faced bye-pass, water distributor, and grates, all 6-in. connections.
To be sold cheap, and application to be made to Mr. H. C. STAFFORD, at the Elsecar Gas-Works, or to THOS. WETFIELD, Secretary, High Street, ROTTERHAM.

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TO CORRESPONDENTS.

A COUNTRY MANAGER.—The process in question, being part of the necessary work of manufacturing the gas as sold, is, without doubt, embraced by the clause referred to.

J. C.—The Secretary of the City and Guilds of London Institute for the Advancement of Technical Education will furnish the information you require on application addressed to him at the Institute, Copper Street, Finsbury.

ALPHA.—When no mention of deposits from intending consumers is contained in their private Act, a Company can only demand security of the usual kind for payment of their account when due, and if this is offered they cannot refuse to supply gas, if their mains are laid sufficiently near to the applicant's premises.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 21, 1880.

Circular to Gas Companies.

ABSOLUTE secrecy is being maintained respecting the proposals received by the Streets Committee of the City Sewers Commission in reply to their invitation for tenders for lighting the principal thoroughfares of the City by electricity. We shall, however, be probably not far from the truth in stating that the competition for the favours of the City Authorities in the matter of street illumination was not so brisk among the various organizations for supplying electric lighting as might have been expected. If this should prove to be the case, and the scheme should consequently be curtailed or abandoned altogether, it will probably be owing principally to the grand scale on which the City Authorities wished to have their experiment carried out. They, perhaps, being accustomed to see any demand on the Gas Companies for more light, easily met by the simple expedient of turning on more gas from sources to them

unseen and apparently inexhaustible, may be pardoned for believing that the substitution of one method of lighting a few miles of streets for another, was merely a question of arrangement of the details of apparatus, and that nothing would be easier than to "welcome the coming, speed the "parting guest." And their belief in the power of any known form of electric lighting to take the place of gas at any moment, and to any required extent, may have been fostered by the blatant advocates of the party in opposition, who are never backward in attributing the slowness with which the electric light is spreading, to anything but its own demerits, or the unreadiness of its purveyors. But it will not surprise those conversant with such matters, if it should transpire that most of the respectable Electric Light Companies find themselves unprepared to undertake more than a small, perchance a very small portion of the great work offered to them by the Sewers Commissioners. This eventuality would not at all deteriorate from the interest attaching to the experiment, provided that the competing parties are sufficiently numerous to make the exhibition important in the aggregate. There is one consolation which the Sewers Commissioners may lay to heart in case the Electric Light Companies do not come up to time. The gas they have always with them, and if they want to get up a show of how streets can be lighted when the will to pay for brilliancy exists, they cannot do better than follow our previously expressed counsel—to add to their earlier design the exhibition of the various improved methods of street illumination by gas, to some of which they are no strangers. If Electric Light Companies are backward, gas burner and lamp manufacturers are eminently the opposite, and any or all of them who have already distinguished themselves in the conflict of gas with electricity would, we are assured, be only too pleased to take a mile or so of streets and show what they can do in turning night into day. Such a course as that above indicated would, as we have already said, make the proposed experiment really valuable and very instructive, whether the whole of the scheduled streets are finally given up to the electric light or not. There are many other thoroughfares, in continuation of, or in contiguity to the streets named, in which a brilliant light would be quite as useful, and we venture to hope that the competition which the Sewers Commission have attempted to inaugurate in a somewhat one-sided manner, may be carried out at last on a fair and complete basis such as we have indicated.

The ordinary half-yearly meeting of the Crystal Palace District Gas Company passed off very harmoniously on Thursday last, the Directors having to report nothing but satisfactory progress in the business of the Company during the past six months. Full dividends were earned on all the stocks and shares of the Company, and the working results appear to have been maintained throughout the half year at a high pitch of perfection. This will be conceded when it is observed that although the Company's district is hilly, and the population widely scattered, the unaccounted-for gas is only $\frac{5}{8}$ per cent. of the total production. The Company hold a strong position financially, having ample capital powers, and we cannot but agree with the remarks of the Deputy-Chairman, Mr. H. P. Stephenson, on the wisdom, in their case, of being content with the maximum dividends they are now enabled to pay, without grasping after more. What the Company might or might not have obtained for an initial price under the sliding scale, if they had gone to Parliament some years back for that purpose, is now beside the question. They might or might not get better terms at the present day than those under which they contrive to exist so comfortably, but the fear of faring worse by going farther may well operate to induce them to be contented with the powers they possess.

The Bristol United Gas Company have had a successful half year's working, during which they have also been compelled to take measures for increasing the storage capacity of their new works at Stapleton. The gross revenue of the Company has declined during the past six months, in consequence of a reduction in the price of gas having been made at the commencement of the year. Full dividends were declared at the ordinary meeting of the Company on Wednesday last, and the business of the current half year is expected to present a marked improvement over that of the period covered by the report just adopted by the Shareholders. The expenditure of capital at the new works necessitated the sale by auction of £20,000 of the Company's stock on the day following the meeting. Good prices were realized, the whole being disposed of at £179 to £181 per cent.

The process of forming a combination Company uniting the interests of the general public, the Local Board, and the

Aire and Calder Navigation Company, for supplying the town of Goole with gas and water, has advanced another step. The Local Board have instructed their Clerk to take the necessary steps, in conjunction with the Engineer of the Navigation Company, to draw up a draft Bill to embody the conditions of the preliminary agreement of which mention has been already made in these columns, and the proposed Bill will then be submitted to the Local Government Board for approval before further steps are taken. The future of the scheme therefore rests with the Central Authority, who will have to decide whether the rates can be drawn upon for supporting a kind of hybrid undertaking, having, moreover, a double character of which one portion will probably be less profitable than the other. The Local Board have not moved too soon, if they wish to get their Bill ready in time for next session. Local Government Board action is not particularly hasty under ordinary routine conditions, and with this unusual business to be settled their proceedings are likely to be more than usually deliberate.

We feel that the letter of Messrs. Beverley and Wyld on the subject of gas apparatus exhibitions, which appears in another column, is calculated to give our readers a somewhat painful impression respecting more than one of these exhibitions, and we regret that the necessity should have arisen for stating, on the authority of our correspondents, that these exhibitions, which were intended to instruct gas producers and consumers in the best means of using gas for purposes other than lighting, should have already been diverted to serve the purposes of a "ring" of manufacturers. It seems hardly credible that the promoters of these exhibitions, whose motives we may be sure have always been to provide the best possible show for the gratification and instruction of their local public, should have fallen so helplessly into the hands of an "association" self-charged with the regulation of such undertakings in their own interests, as appears from the communication in question. The promoters may have felt weak, and the "association" have been strong enough to impose, and insist on their own conditions. The eminence, or the contrary, of the members of a ring of this nature, and with these objects, does not affect the principle involved, which is the restriction to the few of advantages which should be open to all; in other words, the subjection to private ends of what should be devoted to the public good. The policy which dictates the formation and controls the operations of a "ring" is so false that it can never stand the light of public notice, which sooner or later it invariably attracts; and it, moreover, generally fails of its object. In cases like the one in point, it is difficult to see how manufacturers who are so jealous of competition that they try to exclude even the smallest suspicion of it, can be justified even from the narrow standpoint of their own interests. If their productions are worth anything they have no cause to be afraid of competitors, and if they are not, they might learn by those which excel them when placed side by side. We trust that this is the last time we shall be called on to notice a subject so unsavoury in itself and so out of joint with the free and open spirit of the time. We may add that rumours of the prevalence of practices such as are exposed by our correspondents have reached us indirectly from time to time, but too vaguely to be altogether relied on, or published with any useful effect. The positive statements now made in reference to this matter will probably warn the promoters of future exhibitions of gas apparatus to be on their guard, for no organization of this kind can exist if strongly and generally set at defiance.

The members of the South-West of England District Association of Gas Managers held their sixth half-yearly meeting at Southampton on the 14th inst., under the presidency of Mr. S. W. Durkin, Engineer and Manager of the Southampton Gas Company. There was no formal opening address, but the President, in a few remarks, called attention to the Employers Liability Act, and recommended every manager to study it very carefully. Respecting gas matters of local interest he announced the intention of the Directors of his Company to introduce Sugg's improved street-lamps into Southampton, by way of a lesson to the Local Authorities. An interesting paper on the extension of gas lighting was afterwards read by Mr. T. Stone, of Weymouth, in which the author gave an account of his experience in taking a lighting census of his district, with a view to increasing the number of his customers, an enterprise in which he seems to have been unsupported, and to have consequently abandoned. We fear that in too many places this disinclination to extend the supply of gas exists, and it is unfortunately an idea apt to work in many different ways, frequently resulting in disaster

to those who follow its dictates most faithfully. Without going in all cases so far as Mr. Stone, and wishing to see Gas Companies carry on a "touting" business, we perfectly agree with the suggestion that all legitimate means should be taken to induce the masses of urban populations to regard gas as one of the simple commodities of their every-day life, as readily purchased and paid for, in their own way, as any other necessary of existence. Mr. N. H. Humphrys, of Westbury, also read a paper, "On Lime for Purifying Gas," which contained some hints and suggestions useful to gas managers in testing lime intended for purification.

A further contribution to modern information upon the subject of gas condensation appears in another column, as a translation of a paper read by Mons. F. Cadel at the last meeting in Paris of the Société Technique de l'Industrie du Gaz en France. The author appears to have been in search of a method of condensation which should avoid risk of deterioration of the illuminating power of gas by the contact of heavy tar, and yet provide for the absorption of naphthalene from the gas by tar before it is removed. A perusal of the paper will show the difficulties experienced by the author in the course of his researches, and also the means finally adopted by him to obtain the required results. It is interesting to notice how closely Mons. Cadel approaches the line of reasoning and observations of Mr. Somerville, in the communication on condensation as practised at the South Metropolitan Gas-Works, read by him before the members of the British Association of Gas Managers in June last. The two arrangements are sufficiently distinct, but on such parity of reasoning it would not have been surprising if they had been much more alike. Mr. Leicester Greville has also been working on the same lines, and has contributed largely, in his recent articles published in the JOURNAL, to the settlement of the question of the relation of the so-called tarry vapours to the illuminating power of gas, and the same subject has also been investigated in Germany; so that any mystery still surrounding the action of gas condensers should not long remain undisputed, now that so many inquirers are giving the matter such careful attention.

THE OWNERS of the Birtley Iron-Works and Pelaw Main Collieries have given notice of the removal of their London Offices from 101 to 46, Cannon Street.

SALE OF STOCK IN THE BRISTOL UNITED GASLIGHT COMPANY.—On Thursday last Messrs. H. R. Farquar and Co., of Bristol, sold by auction £30,000 worth of capital stock in the Bristol United Gaslight Company. The stock was offered in lots of £100 each, and the whole of it was sold at from £179 to £181 per cent.

DEATH OF MR. WILLIAM HASSELDEINE PEPPY.—The number of English engineers who have settled on the Continent, and become famous there, has been diminished by the death, on the 4th ult., of Mr. Wm. Haseldine Peppy, of the Gas-Works of the Peppy family, who died on Christmas-day, 1877, and in his sixteenth year, was in Berlin in connection with the then newly-established Imperial Continental Gas Association. In 1838 he built the gas-works at Ghent; and in 1844 became Engineer of the Cologne Gas-Works, from which position he retired in 1876.

THE LATE MR. EVANS.—The Illustrated London News says: "The will (dated Feb. 16, 1878) with a codicil (dated April 22, 1879) of Mr. Edwin John Evans, late of Claydon, Brentford, Middlesex, who died on July 8 last, was proved on the 20th ult. by Mrs. Cecilia Anne Evans, the widow and acting executrix, the personal estate being sworn under £35,000. The testator bequeaths to his wife £1000 and an annuity of £1000, and certain of his furniture, plate, and effects for life; to his niece and adopted daughter, Minna Fanny Cecilia Evans, an annuity of £100 during his wife's lifetime, and at her death such a sum is to be set apart upon trust for his said niece as will produce £600 per annum; to his sister-in-law, Mrs. Amelia Miller, an annuity of £200; annuities to nieces and other legacies. As to the residue of his property, the income is to go to his wife for life, and at her death the capital between some of his nephews and nieces."

THE GAS APPARATUS EXHIBITION AT BELFAST.—With reference to the exhibition of gas apparatus which was held in the Grain Market, Belfast, from the 17th to the 28th ult., we understand that it was a great success. Gas appliances for heating and cooking purposes were quite a novelty in Belfast, and although the public did not patronize the very extensive and larger sizes, we are informed that they showed their appreciation of the advantages of gas for cooking purposes by purchasing freely of the medium and smaller sized ranges. The attendance over the eleven days during which the exhibition was open amounted to upwards of 8000, of which over 5000 were by payment of fee, and it is believed that the attendance could have been kept open another week, the attendance would have very largely increased, as the Belfast public were only beginning to take a real interest in the subject during the last week. The whole of the arrangements were under the superintendence of Mr. J. Stelfox, the Engineer and Manager of the Corporation Gas-Works.

CARDIFF GAS COMPANY.—The eighty-seventh half-yearly meeting of this Company was held on Tuesday, the 7th inst.—Mr. G. Phillips in the chair. The report of the Directors, and statement of accounts for the half year ending June 30 last, which were presented, were taken as read, and the Chairman, in moving their adoption, stated that a new boiler and other extensions at the Grange works were in progress. There were necessary to meet the increasing demand for gas, while the Directors had under consideration a reduction in the price charged to consumers. The present price is 2s. 10d. to 3s. per 1000 cubic feet, and the illuminating power, as tested by Sugg's "London" Argand burner, is 16 candles. Dividends at the rate of 10 per cent. per annum on the "A" stock, 5 per cent. on the "B" stock, and 7 per cent. on the paid-up capital created by the Act of 1870, were declared. The thanks of the meeting were voted to Mr. Bowen, the Engineer and Managing Director, and also to the Chairman and Directors, for their attention to the interests of the Company.

Water and Sanitary Notes.

THE Registrar-General reports, upon the authority of Dr. Frankland, that "all the samples of Thames water supplied to the Metropolis during August were of very bad quality, and were quite unfit for dietetic purposes, owing to their pollution with organic impurity." The Lea water is described as not much better. "A Surgeon," influenced by this recital, writes to the *Standard* proposing that the Water Companies should be "prosecuted for supplying what is injurious to health." The *Evening Standard*, commenting on Dr. Frankland's condemnation of the supply, observes: "It is some consolation to find that the Registrar-General reports that during the month when, as Dr. Frankland states, all the water supplied was of very bad quality, and quite unfit for drinking purposes, the inhabitants of the Metropolis were nevertheless in an exceptionally excellent state of health, the mortality being lower than it has been for more than a year." In the report issued under date of the 13th inst., we find the Registrar-General saying with regard to London: "The annual death-rate from all causes, which had steadily declined in the six preceding weeks from 24.9 to 20.8, further fell last week to 19.8, a lower rate than has prevailed in any week since the beginning of July." Looking down the list of twenty large towns in the United Kingdom, we find that the death-rate in respect to zymotic diseases is lowest of all in London, and the death-rate from all causes is lower in London than anywhere except Bristol. London has a zymotic mortality for the week of only 4.8 per thousand per annum, while Brighton has 8.8, together with a mortality from all causes of 31.6. Yet Londoners go to Brighton for health! The zymotic death-rate at Wolverhampton is 13; at Norwich, 14.6; at Liverpool the same; at Leicester, 21.7; and at Salford, 22.7. The *Evening Standard* discreetly observes: "It may be concluded that, unpleasant as it may be to drink water teeming with organic impurity, yet that this fluid is not, after all, so deadly a poison as our scientific friends would wish us to believe." Some pertinent remarks on the effect of neglected house-cisterns on the water supply occur in a letter addressed to *The Times* last week by Mr. Bernard Dyer.

From the complaints which are made in the Paris papers as to the presence of ill odours in that city, we are led to conclude that the drainage of the French metropolis is not altogether superior to that of the British capital. Possibly the French arrangements are not complete, but if the incompleteness chiefly refers to the final disposal of the sewage, we hardly understand why bad smells should prevail in Paris itself. Within and without, Paris appears to be troubled. According to one account, "the gutters smell, the sewers under repair smell, and the evening breeze brings with it insupportable odours from certain establishments situated in the outskirts of the capital." A ramble on the Boulevards fails to secure the enjoyment of fresh air, the atmosphere being "contaminated by pestilential exhalations." Paris has a large area under sewage irrigation in the fields of Gennevilliers, and this it is proposed to extend still further. It is not explained whether the offensive "establishments" are in any case connected with the sewage works. Possibly they are of the nature of those factories which are crowded together in the region known as "London over the border." But if the present complaints as to the sanitary condition of Paris are well founded, it does not seem that we have much to learn from our French neighbours in regard to urban sanitation, especially when we consider the far greater volume of the London sewage as compared with that of Paris, and the enormous extent of the manufacturing interest on the borders of the British metropolis. London has, however, one advantage in the magnitude of the river which flows through it. If the Thames in London were no bigger than the Seine in Paris, the sewage question in our own case would be much more serious than it is. Could we only get rid of our smoke, London, adorned as it is with a continually improving architecture, and with many new embellishments, would begin to challenge comparison with its elegant competitor. For the present, we must be content to plead the superior healthfulness of London among the cities of the world. Thus, according to the latest returns, we find Paris having a death-rate of 26 per thousand, while that of London is 21 only. Some of the offensive odours with which the Parisians are annoyed are alleged to arise from the house drains, which the landlords are allowed to neglect to an extent certainly not permitted here.

Leicester, when its water-works were first established, had a population of about 60,000. The number has since risen

to 130,000, and is still increasing. The water supply has been enlarged during this period from 1,600,000 gallons per day to 3,000,000, the present quantity being rather more than 2½ gallons per head per day. The Corporation, to whom the works now belong, have just completed a new filter-bed, which was opened with some ceremony one day last week. Another filter-bed is in course of construction, and the cost of the two is estimated at about £8000. The old filter-beds are four in number. The surrounding villages drawing upon Leicester for their supply of water, enhances the necessity for enlarging the works, and the demand is said to be growing very rapidly. The works were set on foot by a Company; but after a while the Corporation "assisted" the Company by taking a certain number of shares. These proved to be a good investment, and ultimately the Corporation purchased the entire undertaking. The result is that they are reaping a profit, and are looking for a handsome balance on the next account, which will go to the credit of the borough. By this we understand that a certain portion of the water-rates will take the place of a corresponding amount in the other rates. We regret to observe that Leicester has lately suffered from an extraordinary outbreak of diarrhoea. In five weeks the deaths from this disease have been as many as 212, and the total mortality in the week ending on the 11th inst. exceeded the births by ten. The epidemic is partly attributed to the disastrous floods which took place nearly two months ago, followed by very hot weather.

The new sewage farm at Horsham is accused of polluting the River Arun, and the subject has been brought before the Rural Sanitary Authority by the district Medical Officer of Health. The water of the river for some distance west of the town is described as a black, thick, offensive fluid, fatal to fish life, and exhaling dangerous gases, prejudicial to the public health. In the tributaries where the mill-wheels agitate the stream the stench is described as unbearable. Moved by this report, the Board of Guardians have decided to co-operate with the Horsham Local Board in steps to be taken for remedying the evil. It would seem that the Arun must have very little water, or else that the sewage farm is a very poor affair. The pollution could scarcely be worse if the sewage went in raw.

At last week's meeting of the Liverpool Town Council, a proposal was made to pay to the Water Engineer a sum of £400 on account of extraordinary expenses he had been put to in connection with the passing of the Corporation's Water Bill during the past session of Parliament. Great opposition was evinced to the recommendation to that effect of the Water Committee; and eventually it was negatived by 28 votes to 15. A discussion then took place as to the proposal, mentioned in a recent number of the *JOURNAL*, to grant £1500 to the Town Clerk as an honorarium for his services on the same occasion. This recommendation was, at the request of the Town Clerk himself, subsequently withdrawn.

It is announced that, at the Edinburgh meeting (next month) of the Sanitary Science Congress, among the papers to be read in the Health Department is one by Dr. Stevenson Macadam, entitled "What are the means which should be adopted for the prevention of the pollution of streams without undue interference with industrial operations, and for the preservation of pure sources of water supply?" Professor Jenkin will read a paper on the following question:—"What is the best mode of amending the present laws with reference to existing buildings, and also of improving their sanitary condition so as to render them more healthy, having due regard to economical considerations?" Sheriff Spens, of Glasgow, in the same department will raise a discussion on the question:—"What are the best areas for sanitary purposes, and how far should there be a revision of the mode of electing and continuing the services of the officers under the Public Health Acts?"

BODMIN WATER COMPANY.—The twenty-eighth half-yearly meeting of this Company was held on the 31st ult.—Mr. Cardell in the chair. The report of the Directors, which was presented, stated that the expenses had been a heavy item in the annual account, and that the state of the river, and the profit and loss account, therefore, showed a loss on the half year's working. The Chairman, in moving the adoption of the report, said he thought that, in ordinary seasons, the Shareholders might expect a small dividend year by year. The report was adopted, and a vote of thanks passed to the Chairman and Directors for their services.

LYNTON WATER COMPANY.—The annual meeting of this Company was held on the 23rd ult.—Mr. J. P. Finch in the chair. The Directors, in their report, referred to the continued prosperity of the Company, and stated that the works were all in good condition. The revenue had again increased, and this might, they said, be fairly looked forward to in future years, as the growing prosperity of Lynton must be reflected on the Company. There was a balance of £148 11s. 7d. in the banker's hands, out of which the Directors recommended a dividend of 7s. per share, being at the rate of 7 per cent., leaving a balance of £22 11s. 7d. to be carried forward to the next account. The report was adopted, and the proceedings terminated.

DROGHEDA WATER COMPANY.—The annual general meeting of this Company was held on the 31st ult.—the Mayor (Alderman Chadwick) presiding. The Directors, in their report, which was presented, stated that there had been an increase in the rental over that received in the previous year, and the reservoirs and pipes were all in good order. The Drogheda Corporation had been making inquiries as to the terms upon which the Company's works would be sold to them; but as no definite offer had been made, the Directors considered it unnecessary to further refer to the matter. The statement of accounts showed a balance of £495 7s. 11d. to the credit of profit and loss account, but as a sum of about £290 had to be provided for, the Directors could not recommend a higher dividend than 3 per cent. Alderman Daly moved the adoption of the report, and the motion was carried unanimously. The retiring Directors and Auditors were re-elected, and the proceedings closed.

Notes.

[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

THE ELEMENTAL MANUFACTURE OF AMMONIA.

Many attempts have been made to utilize the nitrogen of the atmosphere on a commercial scale, but hitherto with little success. Among all the commercially valuable nitrogenous compounds, ammonia has long been considered the most promising of successful synthesis from its elements as they exist in air and water. But, either from defects of method or apparatus, or both, the production of ammonia from the union of atmospheric nitrogen with nascent hydrogen from the decomposition of steam, although quite possible, has not yet become a regular industry, and the ammonia of commerce has still been most largely obtained from gas liquor. According to the *Chemical Review* for the current month, a process—differing in some respects from Mr. Rickman's earlier invention, which we noticed in the JOURNAL in the spring of this year—has, however, been discovered by Messrs. Rickman and Thompson, which is capable of producing ammonia from air and water, with only one intermediate step. The principal difficulty met with in the endeavour to make ammonia from its elements has been the narrow margin existing between the temperatures of its formation and decomposition. Steam only decomposes at a full red heat, while a bright red will decompose the ammonia which is formed at the lower temperature, and therefore the margin in which it is alone capable of existence immediately after formation is too narrow to be relied on in practice. The new process gets over this difficulty by causing the formation, at first, of ammonium chloride—a compound which sublimes at high temperatures, but does not decompose. The apparatus employed consists of an ordinary coke furnace provided with means of controlling the supply of air to the fire, which is maintained with small coal mixed with 5 to 8 per cent. of common salt. The chlorides of sodium and calcium decompose in presence of nascent ammonia, and one of these is therefore chosen. The steam required is produced by the waste heat of the same fire. Ammonium chloride is thus formed at a full red heat without risk of loss by accidental rise of temperature. In use, 20 to 28 lbs. of coal dust and salt per hour produce 2 to 3 lbs. of ammonium chloride, and from the simplicity of the necessary plant and the cheapness of the materials, the process is expected to be very economical.

GAS-FLAMES.

M. Neyrenneuf describes in the *Journal du Physique* for August some experiments made by him with gas-flames. Two flames at the ends of tubes of unequal length, standing on an atmospheric reservoir, were observed to be differently affected when the pressure of gas was reduced, the lower flame being sooner affected thereby. The lower flame will go out or fire back, according to the size of the orifice, while the other remains burning, until it will even become reduced in power while burning by the addition of air entering by the shorter tube. With a Y-tube burner a similar effect may be observed if the pressure is sufficiently reduced, when the slightest inequality in height of the top edges of the tubes will be betrayed by the consequent difference in the flames. The same effect is also noticeable with a single tube. If a white flame be produced with an ordinary Bunsen burner and the cock gradually turned off, at a certain moment the flame will divide, the outer portion will be lengthened and become slightly paler, while the inner will turn backwards and heat the burner as though it were on fire internally. This divided flame is also sensitive. A Bunsen flame may also be made sensitive by making it horizontal, and it will be sufficient to reduce the pressure to that required to straighten it. With a tube several décimètres long, having a lateral opening at its base, the draught of air can be made to strengthen as the gas pressure becomes feeble. A flame from a thinned-out orifice gives a low sound when disposed horizontally. Two inclined flames if made to strike against each other will give a very perceptible sharp sound. All these experiments were made with gas at the ordinary pressures as for consumption for illuminating purposes.

THE EXISTENCE OF MATTER IN THE LIQUID STATE.

Professor Carnelley, of Firth College, Sheffield, communicated to a recent number of the *Chemical News* an account of experiments conducted by him with reference to the determination of the conditions necessary for the existence of matter in the liquid state. He concludes that (1) in order to convert a gas into a liquid the temperature must be below a certain point (termed by Andrews the critical temperature of the substance), otherwise no amount of pressure is capable of liquefying the gas; and (2) in order to liquefy a solid, the pressure must be above a certain point, which Professor Carnelley proposes to call the critical pressure of the substance, otherwise no amount of heat will melt the substance. As a consequence of the second of these propositions, it follows that if the pressure on any substance can be kept below its critical point, the melting point of a solid under ordinary conditions can be largely exceeded without liquefying it. Hence, for example, it should be possible to obtain such an anomaly as red-hot ice, and this is, in point of fact, what Professor Carnelley has succeeded in doing; or, at least, he has managed, by keeping the superincumbent pressure below 46 mm. of mercury—i.e., the tension of aqueous vapour at the freezing point of water—to keep ice for a long time as hot as it could not be touched without burning the hand. After this, molten iron at a freezing temperature will perhaps become a common

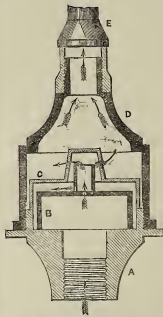
spectacle, and icy sunbeams will scarcely afford very great scope for wonderment.

THE LIGHTING OF PARIS.

The Municipal Authorities of Paris, in unison with the Gas and Electrical Lighting Companies, are, says *Galignani*, studying all sorts of plans for improving the illumination of the city. Large contracts are being signed for candelabras in cast-iron and bronze, for *lanterne-bouquets* (as the clusters of lamps on the street refuges are euphoniously called) and all their appurtenances; and very shortly, no doubt, Paris will be, if it is not already, the best-lighted city in the world. The history of street illumination in the French metropolis presents a fair specimen of how that type of civilization has progressed since the Middle Ages. Public street lamps or lanterns made their first appearance in Paris in the sixteenth century, though they were then but few in number, and by no means perfect in themselves, street lighting being greatly improved by Mons. De la Reynie, an officer of the police, during the reign of Louis XIV. To judge from contemporary accounts, the street lamps of the seventeenth and eighteenth centuries must have given a very picturesque appearance to the public promenades, such as the Cours-à-Reine and quays, along which they were placed. The invention of *réverbères* or reflecting apparatus dates from a hundred years or so back, and with its reflectors, oilpots, weights and counterweights the first *réverbère* must have been a rather complicated affair. Improvements were introduced by degrees, and reflectors were only dethroned at last, after a severe struggle, by gas.

A NEW STREET-LAMP REGULATOR.

Mr. Suggs, of Westminster, has lately perfected a compact and simple form of regulator for street and other gas-lamps, of the construction shown in the accompanying illustration. The body of the regulator, A, is made in brass or soft metal. Gas entering from below raises a bell of steatite, B, furnished at the top with a small tube open at its upper end, and pierced with a small hole just above the bell. The bell fits loosely into its seat, and is covered with a metal cap, C, of similar shape, with two holes in the side of its upper tube, which is closed at the top. The whole is covered with the outer case, D, from which a tube, E, leads to the burner. The course of the currents of gas is shown by the arrows in the engraving. The steatite bell, which is not liable to set fast or get foul in use, is weighted to the required pressure, and when this is exceeded it rises, and the top tube serves as a valve to cut off the outlet holes in the inner cap. The regulators are of substantial construction, and appear to answer their purpose admirably at any



inlet pressure from 5-10ths to 6 inches, while they are much less cumbersome than the diaphragm street-lamp governors in common use.

RAILWAY CARRIAGE LIGHTING IN GERMANY.

From reports recently obtained from the various German railway authorities it appears that the present state of the lighting of carriages is as follows:—For lighting material, rape-seed oil, gas, and, to a considerable extent, even candles, are used. Of some 16,168 carriages adapted for illumination, 10,968 (or 67·8 per cent.) are lit with rape-seed oil, 2653 (or 16·4 per cent.) with gas, and 2547 (or 15·8 per cent.) with candles. In addition, experiments have been made on some lines with the so-called Möhring oil, which is a mixture of petroleum and rape-seed oil. The gas used is partly made in works belonging to the railway, from fat, paraffin, petroleum, gas oil, or coal tar oil, partly obtained from gas-works. The holders, in which gas can be compressed to 5½ or 6 atmospheres, are fixed under the carriages, and connected with the burners by means of tubes with pressure regulators and valves. The filling of the holders is accomplished either direct from the gas-works by means of caoutchouc tubes, or through transportable reservoirs, which can be filled with 5 or 6 cubic metres of gas pressed to 10 atmospheres, or from small vessels. A single filling of a holder suffices for 30, 40, or even 60 hours burning. The average cost given by the authorities, per flame and hour of burning, varies in the case of gas between 2 and 3·37 pfennig; in the case of oil, between 0·667 and 7·5 pfennig; and in the case of candles, between 1·8 and 6 pfennig.

BROADSTAIRS GAS AND WATER SUPPLY.—At the meeting of the Broadstairs Local Board on the 6th inst., Mr. Kidd gave notice of motion to make overtures to the Gas and Water Companies supplying that place, with the view of the Board purchasing their undertakings.

CASTLEBAR GAS COMPANY.—The sixteenth annual report of this Company recently issued, states that the receipts from all sources amounted in the past year to £738 2s. 1d. and the expenditure to £576 10s. 11d., leaving a balance of £162 1s. 2d. From this it was recommended to pay the usual dividend of 5 per cent. upon the paid-up capital of the Company, and carry forward the balance to next account. Since last year the price of gas has been reduced to 6s. 8d. per 1000 cubic feet, and this has involved a deficiency in the receipts to the extent of 450 7s. 7d., as against the previous year.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

GAS APPARATUS EXHIBITIONS.

A STRANGE COMBINATION.

SIR,—In the interests of fair play, to which your columns have always been open, we desire to present a brief narrative of facts in connection with the "Gas Apparatus Exhibition" now being held in Dublin.

In response to the advertisement of the promoters, inviting communications from intending exhibitors, we promptly sent in a written application for space to show our "Leeds" patent and other gas cooking stoves. After waiting about a fortnight for a reply, we received a note expressing regret that there was "not space" available for our goods. Having been amongst the earliest applicants, we were surprised at this intimation; and wrote asking for an explanation. In reply to this inquiry, the Secretary shifted his ground; and, no longer alleging want of space, simply informed us that he had "committed all the arrangements to an association of cooking apparatus makers!" adding that he trusted this would "explain the situation." This strange disclosure did explain the situation, but in a manner which must be condemned by all who appreciate the manifold advantages of free and unrestricted competition.

What are the nature and objects of the so-called "association"? It consists of Messrs. Leoni and Co., of London; John Wright and Co., of Birmingham; Billing and Co., of London; Hassall and Singleton, of Birmingham; Davis and Co., of Bath; and C. Wilson, of Leeds. The secrecy of their proceedings is confirmed in a note, which we extracted from the first-named firm, to the effect that their meeting was strictly private. In a subsequent conversation with a member of this clique the true purpose of their combination transpired. It was to the effect that they wished to keep all the gas apparatus exhibitions in their own hands; and it is perhaps natural that, apprehensive of being beaten in the race, they should unite their energies to exclude dangerous rivals.

What will most surprise your readers is that a public Gas Company in Dublin, professing to exhibit all the best means of using gas other than for illuminating purposes, should have been induced to play directly into the hand of a small clique of manufacturers and traders, whose sole object is to protect and promote their own interests. Impressed with the extreme unfairness of such an exclusive policy, we wrote in a tone of remonstrance to the Secretary of the Dublin Exhibition; and, on the 21st of August, received a reply, stating that if we had any special or novel apparatus in economy, price, or construction, they would be glad to exhibit them. In the preliminary advertisement inviting applications for space there was no stipulation whatever as to novelty, and if this condition had been pressed in the case of the associated firms it would have excluded them from the exhibition. Under these circumstances it was a palpable subterfuge to insist upon novelty as a *sine qua non* in our case; but we were, nevertheless, prepared to accept the new condition, and sent a stove which had not been exhibited previously. Anxious to secure a "fair field and no favour," our Mr. Wyldie went to the expense and trouble of twice visiting Dublin, where one of the Gas Company's responsible officers stated that, although dissatisfied with the course adopted by the "association," the promoters of the exhibition felt bound to abide by the arrangements. He added that, nevertheless, an effort would be made to let our firm have space. After further communication by letter and telegram, the result is that, instead of being allowed adequate space to show our goods, we were tardily allowed to show only one stove, and this, as before stated, was closely restricted to a novelty.

It is certainly not by such management as we have described that gas apparatus exhibitions can be made most effectively to serve their useful purpose; but surely promoters of such exhibitions ought in the first instance to be "committing all the arrangements" to an association of exhibitors, who take advantage of their opportunities to exclude their more successful competitors.

Least it should be supposed by any that this is only a personal grievance, let us add that other respectable and enterprising firms in the same line of business have been similarly dealt with. We do not think that this trades-union will exist after exposure in your columns, and we therefore ask you to insert this letter.

Leeds, Sept. 17, 1880.

BEVERLEY AND WYLDIE.

THE EFFECT OF FROST ON GAS APPARATUS.

SIR,—In the JOURNAL of the 7th inst., I observe there is a report of the last meeting of the North British Association of Gas Managers. In this report reference is made to a paper by Mr. Whimster, of Perth, in which there is a remark on the expediency to prevent the water in gasholder-tanks from freezing. His remarks, however, on this subject appear to have been passed over unnoticed. I think this is a pity, as they were perhaps the most valuable he made—remarks calculated to aid gas managers in contending with the difficulties which have to be encountered in keen frosty weather, especially in regard to the freezing of their gasholder-tanks.

At the meeting of the North British Association held in Edinburgh last year (see JOURNAL, Vol. XXXIV., p. 181), Mr. Whimster referred wholly to the use of exhaust steam. But the arrangements referred to in the latter portion of his latest paper—as to connecting the gasholder-tanks by pipes to a cistern over the retort-bench, or, it may be, over flues at the ground-level to the chimney, or by a special boiler and fire expressly built for the purpose, to supply one or more tanks—are the inventions of, or arrangements designed by Mr. Key, and, therefore, in all fairness should not have been made public, I think, without being coupled with that gentleman's name. We have already seen how difficulties and differences of opinion in after-years so easily arise, in consequence of the thoughtlessness of some parties who, while reading a paper, make use of the ideas or inventions of another, without mentioning the name of the author or inventor. Now, unless the wrong impressions thus conveyed are at once corrected through the medium of your JOURNAL, the effects might be very serious.

It is now three years since Mr. Key, in a conversation with me, sug-

gested the placing of a cistern, to be heated by my main flues, to prevent the gasholder-tank from freezing—the cold water circulating from the tank to the cistern, and the hot water from the cistern to the tank. In his letter on this subject in the JOURNAL of the 19th of August last year, Mr. Key provided for the heating of the lute of a telescoped holder when full of gas; but in working his system throughout last winter he found it quite unnecessary, as the temperature of the surface of the water in the gasholder-tank was easily kept at 120° Fahr., as desired, and when the holder "capped," taking warm water with the lute, and by evaporation and radiation the holder plates were kept warm when the thermometer was at 19° Fahr. within 3 yards of the tank. After working his arrangement for some time, it was secured by provisional protection, merely, I understand, to prevent a repetition of such correspondence as occurred relative to his design for an hydraulic main overflow. The plan Mr. Key now works upon is that of having valvular openings at different depths in the suction-pipe, going to nearly the bottom of the tank, whereby he can draw from the bottom or at any desired depth, and thereby heat up a stream of water over the entire surface of the tank of any desired number of feet in depth. This is to counteract the injurious effect of frost on the gas, by preventing the frost affecting the gas through the crown of the holder.

I concur with Mr. Whimster in thinking the arrangement worthy of notice, but venture to go further than he, and to say it is not only for the small gas-works he speaks of, but, as in Mr. Key's case, where it is applied to a holder capable of storing 1,500,000 cubic feet of gas, is also applicable to large works; and I understand a large gas-works in Scotland will have the holders fitted up with his arrangement on a large scale this new winter.

Gas-Works, Old Kilpatrick, Dumbartonshire,
Sept. 10, 1880.

JAMES BLACK.

GAS COOKING OVENS AND TESTIMONIALS.

SIR,—I last year gave a testimonial to the makers of a certain gas cooking oven, beginning thus: "Without wishing to depreciate any other gas cooking ovens, I regard yours in construction, and in utilizing all the heat given off by the gas, as 'amongst' the most economical and efficient in the market." Whereas, by omitting the word "amongst," when printing it, my testimonial is made to read, "I regard the oven in question as 'the' most economical and efficient in the market." Now in justice to myself, and to other makers of gas cookers, I wish to set myself right. This I shall do as gently as possible, and shall not give the names of the makers referred to, because, if even the omission in this case is not a printer's error, I believe upon the ground of trade morality very few could afford to "throw the first stone." At the same time without pretending to be a saint myself, testimonials ought to be at least true, and a guide in business. But, unfortunately, in this "diamond-cut-diamond" age they are fast approaching the mere level of Pindar's ravens—"made for sale," and I am afraid, if this sort of thing is allowed to go on, the integrity of business will soon be "whittled away to nothing."

Gas-Works, York, Sept. 10, 1880.

CHAS. SELLERS.

ST. ANDREWS GAS COMPANY.—The forty-sixth annual meeting of this Company was held on Friday, the 10th inst., when the accounts for the year ending the 30th ult., which were presented, showed that the net income from gas and meter rents amounted to £2359 19s. 10½d.; added to this, £154 6s. 7½d. had been received for public and other lamps; coke and tar had brought £200 15s. 1d.; interest, £83 8d.; and £3929 15s. 9½d. There had been expended on coal and cartage, £1509 13s. 9½d.; lime, £55 5s. 8d.; retorts, £40 8s.; repairs and renewals, £306 8s. 8d.; salary and wages, £496 9s. 8d.; rents, £89 14s. 7½d.; miscellaneous, £55 13s. 4d.—total, £4983 10s. 2½d., which deducted from the income left a balance of £1046 5s. 7½d. The gas supplied is of the Oldham power, 26 candles, and it is charged at the rate of 4s. 7d. per 1000 cubic feet. The quantity supplied by meter during the past year was 16,811,906 feet.

AKCOWITHE, PEATHESTONE, PURSTON, AND SHARLTON GAS COMPANY.—This Company held their half-yearly meeting on Tuesday, the 7th inst.—Mr. A. Vardens, Chairman. The Secretary (Mr. Watson) read the notice convening the meeting, also the balance-sheet, which compared favourably with the corresponding half of last year. The Directors' report showed that considerable improvements and extensions had been carried out during the past six months, one of the gasholders having been repaired, two new purifiers erected, and improvements effected in the retort-house. There was now plenty of storage room for gas, and four purifiers; the works were in good working order, and the Company were in a position to meet all the requirements of the coming season. The leakage had been reduced from 30 to 15 per cent. The report and balance-sheet were adopted. The Chairman proposed that the payment of a dividend of 2½ per cent., which was carried unanimously. All the Directors were re-elected, and the Chairman, in thanking the Shareholders for their confidence, said they would always try to do their best for the Company. The Shareholders were informed that the Gas Bill had passed successfully through the House of Commons, and received the Royal Assent on the 2nd of August, and came into operation on the 1st of the present month. A vote of thanks to the Chairman, Directors, and Officers terminated the meeting.

OLDHAM CORPORATION GAS AND WATER SUPPLY.—At the meeting of the Oldham Corporation Gas Committee on the 8th inst., reference was made to the subject of reducing the price of the gas in the out-townships. The Chairman (Alderman Wainwright) explained that according to the new Borough Improvement Act the Gas Committee would not be able to charge as much for gas in the out-districts, as compared with the Oldham price, as they had done in the last year, and he thought it would be necessary to reduce the price charged in those districts 2d. per 1000 feet, to bring it in accordance with the scale allowed by the new Act. At the same time the Water Committee had resolved to give notice of an increase in the price of water, to take effect on the 25th of December next. They had to give three months notice of this increase, which would be 1½ per cent. on the rack-rent. Hitherto the out-townships had had water at the same price as the Oldham consumers, but in future they would have to pay 1½ per cent. more. The notice of the increase would be put on the September order, and it had been suggested that an increase of the reduction in the price of gas should be given at the same time, as it would "look better." It was thought that consumers of gas in the out-districts might possibly insist on the reduction in the price of gas taking effect from the 8th of November, when the Act came into operation; but it being determined that the Town Clerk should under the Act issue a special point in connection with this question, the matter was adjourned.

Legal Intelligence.

SURREY QUARTER SESSIONS.—THURSDAY, SEPT. 9.

(Before Mr. HARDMAN, Chairman.)

THE CONSPIRACY TO DEFRAUD A GAS COMPANY.

Thomas Henry Carman, landlord of the Grapes Tavern, Windmill Street, Haymarket, *William Thomas Horton*, a clerk (his son), *George Phillips*, secretary of the New Kent Club, Station Road, Elephant and Castle; and *Joseph Horton*, gas-fitter, were indicted for having, in the month of May last, unlawfully conspired to feloniously steal a quantity of gas, the property of the South Metropolitan Gas Company. On other counts of the indictment they were charged with conspiring to cheat the Company of the gas; with conspiring to fraudulently obtain the meter from registering the quantity of gas supplied to *Thomas Henry Carman*; and with unlawfully attempting to steal a quantity of gas belonging to the Company. To all these counts the prisoners pleaded not guilty.

Mr. BESLEY and Mr. Mew conducted the prosecution; Mr. MONTAGU WILLIAMS defended the Carmans; Mr. JOHNSON WATSON appeared for Phillips, and Mr. G. E. LYON for Horton.

Mr. BESLEY, in opening the case, said he appeared with his friend Mr. Mew to conduct the prosecution on behalf of the South Metropolitan Gas Company, and the charge was that a plot had been entered into by the defendants for the purpose of burning gas without its being registered by the meter, and therefore without its being paid for by the consumer. It was as well that he should tell the jury who the persons were who were now on their trial. The elder Mr. Carman was a licensed victualler, keeping the Grapes Tavern, Windmill Street, Haymarket, and he appeared, for the advantage of his son, to have been a tenant of the meter called the New Kent Club, carried on in an arch of the London, Chatham, and Dover Railway, in Station Road, Elephant and Castle. Here there were a number of billiard-tables, and owing to the play going on and the late hours to which the club, not being restricted by law, could be kept open, there were a large number of gas-meters. The young Mr. Carman was put in charge of this club, and the prisoner Phillips was manager with him. With regard to Phillips the jury would, of course, see that there was sufficient evidence to satisfy them that he was aware of the unlawful nature of the plot, and that he took part in it. As regarded *Carman*, senior, the learned counsel would not be able to establish that he obtained and received the profits of the place, the motive would be strong enough to support the case, if the facts were proved clearly before them. With regard to *Horton*, who was the principal actor in the matter, it would seem from his statement before the Magistrate as if he was content to allow to admit that he was a gas-fitter, and that he was guilty of tampering with the gas-meter. *Horton* was a man who had been in a gas-meter manufactory, was a gas-fitter, and undoubtedly well acquainted with the mechanism of gas-meters; but he was not thoroughly conversant with the new mode of constructing them, though he knew perfectly well the character of the meters, and he was a man who had been in the habit of being lodged for some weeks at 12, Hanover Court, Long Acre, and in the same lodgings was a man named *Allen*, whom he (the learned counsel) would put before the jury as a witness who would require confirmation in every particular. If the case turned upon *Allen*'s evidence, without corroboration, he would not have to say anything more about it. The connection between *Horton* and *Allen* was to a certain extent increased by the fact that they were employed for a short time in reference to the salvage of the fire which occurred at the Civil Service Stores, in Bedford Street, Covent Garden, in May last. While they were so engaged they frequented Mr. *Carman*'s tavern, in Windmill Street, Haymarket. It seemed that *Horton* on one occasion, when alone with *Allen* and Mr. *Carman*, sen., remarked that, being well acquainted with the mechanism of gas-meters, he knew a very simple way by which a portion of the gas passing through the meter would not be registered by the index. The jury would notice that if *Horton* had been successful in stopping altogether the registering of the meter index, the Gas Company, through their Inspector, would soon find it out. Therefore it was a very different thing to tamper with a meter so that a portion of the gas should be registered, and to tamper with one in such a way as to stop its registration altogether. *Horton* was in the habit of saying that "a dry meter it is of no use; I can only operate upon a wet meter," and Mr. *Carman*, instead of doing what he (the learned counsel) would have expected a person in his position to have done—getting information from him if possible for the benefit of the Gas Company—said, "I will not do that; when the hole was made in the water where there is a great consumption of gas going on, and where there is a wet meter." Accordingly *Horton* was introduced to Mr. *Carman*, jun., and to Phillips. It would be as well that he should explain generally the mode in which wet and dry meters were made, to show how it was that a wet meter mentioned specifically by *Horton* as the kind of meter to be tampered with. [The learned counsel then fully described the construction of ordinary wet and dry meters, with which our readers are familiar.] Formerly in the wet meters there was no guard, and, therefore, a workman like *Horton*, who knew the mode of manufacturing them, could, with a blow and hammer, make a hole in the cap and find out the gas that whenever it rose to the point above water where it was pierced, the gas would come out without being registered, and find its way out through the out-pipe, and there would, of course, be a passing away of gas to the extent of the hole made in the drum during the period of the hole was open; and, therefore, before the hole was made, the meter would register correctly. This explained how the plan of using a portion of the gas without payment prevented detection, because the Inspector would see that, though the meter did not register quite so much as in the corresponding half year, still there might be many reasons for this decrease, and he would not be able to say that the meter was tampered with simply because the quantity of gas registered was less. In *Horton*'s time they did not put a guard at the bottom of the meter. This was an upright piece of block tin behind, forming a protection against any perforation of the drum. It would be important for the jury to consider that *Horton*'s statement, before the Magistrate, that he trusted in scientific gentlemen, and they would have to see whether he gave such a description of the operations by *Horton* as was confirmed afterwards by an examination of the meter. He said the first thing *Horton* did was to get a file filed down to a very sharp point, for the purpose of making the perforation, and it appeared that when he found the file was useless, the younger *Carman* gave him half-a-crown to have a drill made sufficiently fine and strong to bore the hole; and it appeared that, going to the club with *Allen*, who acted as an ordinary workman, he took off the cap and, according to *Allen*'s account, said, "I never met with a meter like this; it has a rather peculiar construction." He said that he took the drum, said, "We'll persuade them we have done it," because, according to *Allen*'s account, an arrangement was made by *Carman*, sen., that *Horton* was to have money paid to him as a reward for damaging the meter so that the gas should not all be registered. "Being a man of the first class," he represented himself, he had no objection to proceed. But when he wanted to get money from Mr. *Carman*, sen., he said he must see that the consumption was less before paying any, and

after taking the meter index for two or three nights, he found the consumption was not less, and, therefore, said the thing had not been done. *Horton* accordingly had some drills specially made, and went again to the club with *Allen*. Both Phillips and *Carman*, sen., were present, and *Horton* said, "We are come over to do the meter again." Accordingly the drills were used, *Horton* hammering away; and presently, hearing a noise in the gas, *Horton* said, "That has done it," meaning he had got through the guard and perforated the drum, and thought he heard the gas coming through the drum, and, thinking that he had been successful, he used the file of the meter being taken to Mr. Detheridge, the Inspector of Meters for the district, it was not known that he had not been successful; but he might tell the jury, at any rate, that he had not—that the drum never was pierced, and that no gas could possibly have been fraudulently obtained, and that *Horton* was not successful in his attempt to do it. After this it appeared that Phillips upon one occasion produced a paper upon which he had taken off the readings of the meter, and upon examining it with young *Carman*, they were really under the impression that the meter had been operated upon successfully, for they considered they were saving 200 or 300 feet of gas a night. A letter was consequently sent to Mr. *Carman* to give *Horton* the reward; but Mr. *Carman* said he should want a few days to see whether it lasted or not. All this, of course, was a mistake made by Phillips and young *Carman*, because, as he had already said, the prisoners had never had a single foot of gas, because the drum of the meter was not pierced. It appeared that from time to time 5s. and 2s. 6d. were obtained by *Horton* from Mr. *Carman*, sen., and then they found themselves surrounded by great difficulties. *Horton* threatened to expose Mr. *Carman*, sen., and so Mr. *Carman* frequently paid over sums of 2s. 6d. and 5s., under the belief that the fraud had been perpetrated, and that *Horton* was not in his story. The learned counsel asked the jury in what particulars he was corroborated. The main corroboration was that he spoke of one attempt and a second attempt, and when the meter came to be taken to pieces, there were two little holes, one large and one smaller, in the guard, but not in the drum. Then there was the account given by Phillips and young *Carman* that they had taken the meter to the guard, then he spoke as to an alteration in the file, and they had a witness who proved that this was true. Then there was the borrowing of steps. They had the man who said he lent the steps to the man who came to borrow them for Mr. *Carman*, jun., at the club. They had also the man who was a gas-fitter, and who was called in to see the meter, and who was told to be said. These were the material corroborations. It appeared that on the 18th of July *Allen* went and saw the officials of the South Metropolitan Gas Company, one of whom, Mr. Howard, would be called, and he had the meter removed and another put in its place, and the meter which was removed was sent to the Gas Company, and the new meter was locked and key until it was examined, and then it was found that the attempt had failed; and that, though the guard had been pierced twice, the drum had not been affected in any way. With regard to the suggestion that this was an ordinary thing to do, that there was something wrong with the meter, and that he had been asked to do it, the learned counsel said: If the meter got out of order they had to send to the Gas Company, and require them to put it right; but no complaint was made. From the time when Mr. *Carman* entered upon the tenancy of this place up to the time of the communication made by *Allen* to the Gas Company's officials, no complaint was made of the meter. If the gas-fitting had required attending to, Mr. *Carman*, jun., would naturally have employed a man who lived close to the Elephant and Castle; it would be unnatural to get a workman to go there from the Haymarket. He asked if it was possible for there to be any explanation for operating upon this meter except that of operating upon it for the purpose of fraud. The jury would have to say whether Mr. *Carman* had not lent himself to *Horton*; he doing this thing for a reward, and young Mr. *Carman* and Phillips both taking part in the matter. Of course, with regard to *Horton* they would have read to them that he said before the Magistrate, for though he denied any fraud upon the part of *Carman*, sen., he admitted tampering with the meter. The learned counsel said upon it, that it was not proper for any one but the Gas Company's officials to unscrew the little plug at the bottom of the meter, and that the operation attempted to be performed by *Horton* could only be for the purpose of fraud. These were the circumstances which the jury would have to consider in the case. He said that the inquiry might take place into the whole matter, and he had now to invite their attention to the evidence.

James Allen, examined by Mr. BESLEY, said: I am now living at No. 36, James's Walk. Formerly I lived at No. 12, Hanover Court, Long Acre. I lodged with Mr. *Carman*, sen., and he was a gas-fitter, and I was a gas-fitter. I first knew the prisoner *Joseph Horton* about the early part of May, as he was lodging in the same house with me. I am a labourer. I did not know what *Horton* was at the time, but afterwards I did. It was working at the salvage from the fire at the Civil Service Stores, Bedford Street. I know the public-house in which Mr. *Carman*'s landlord lives in Great Windmill Street. I remember going there with *Horton*. On about the second occasion of my going there with *Horton*, when only he, Mr. *Carman*, and I were present, *Horton* told Mr. *Carman* he could effect for him a great saving in the consumption of his gas. Mr. *Carman* asked how this was to be done, and *Horton* said he would show him. He took him to the meter, and the gas would escape into the body of the meter, and so pass through without being indexed. Mr. *Carman* said he quite understood that, but his was a dry meter, not a wet one; but he knew a place in the New Kent Road where they consumed a large quantity of gas, and that he could do it there. He said he would take him to the place, and he would go to the place referred to. *Horton* went with Mr. *Carman* into a back room, and made some private arrangement as to terms, but I could not hear what was said. *Horton* came out and told me he had arranged with Mr. *Carman* to receive £3 for the job—that he asked a note, and Mr. *Carman* gave him a note, and he gave him a receipt. He said that the meter was to be paid by instalments, 10s. to be paid first, and the rest by monthly instalments. Almost immediately after we received the direction we went over to Station Road, New Kent Road—that was the following day. We did not take any tools. We went to the New Kent Club, which is a midway house between Station Road, Hilliard Road and club. We there saw Mr. *Carman*, jun., and Mr. Phillips. It was about half-past ten in the morning when we arrived there. I went into the club with *Horton*, but I did not hear anything that was said to Mr. *Carman*, jun., or to Phillips. Mr. *Carman*, jun., gave *Horton* 2s. 6d., and told him to get the tools and to get the meter fixed. He told him to have the drill produced made. *Horton* said he wanted a drill made, and he picked up a three-cornered file and asked the smith to draw it out. Afterwards I stepped outside while the file was being drawn into a drill. *Horton* came out and said he had taken it out and made it round—made a bevel edge to it, so he had taken the file away from the smith, and he had a bevel edge to it, and he had a bevel edge to it. I saw that done. *Horton* led 2s. 6d. on it, and was to pay 6d. for the making of it. I pointed out the shop to detective Reed. Having got this tool we came back to the New Kent Club. *Horton* then directed me to go next door and borrow a pair of steps. The steps were to get up to the meter, which was in a room at the end of the back room, and when I went back *Carman*, jun., was standing in the billiard-room, and Phillips was having his breakfast at a side table almost at the end of the room. I placed the steps, and *Horton*

mounted up to the platform where the meter was, and called me up to follow him. He then unscrewed the top of the outlet plug of the meter, and introduced his drill and gave two or three thumps. He then said, "I have never seen a meter like this before; there is a metal guard or plate in front." He did not speak loud enough for Carman, jun., to hear. Then he said, "Never mind; let them think it is done," and he put some water in the meter and replaced the plug. Having done this, he came down the steps and went up to Mr. Carman, jun., and I believe I heard him say, "I have done it," and they walked away to the bar. I did not hear any other conversation beyond what I have spoken to. We then left, and at night went over to Mr. Carman, sen. We took the file back, and on that occasion Mr. Carman, jun., accompanied us. He did not go into the shop, but stayed at the top of the roadway with me while Horton went and returned the file to Mr. Carman, sen. Mr. Carman, jun., said, "I am not sure whether it was on this or on another occasion that Horton took a note over from young Mr. Carman to Mr. Carman, sen., but late that afternoon we went to the Grapes. Horton told Mr. Carman, sen., he had done the job, and Mr. Carman gave him 5s. Horton said, "That is not according to your agreement; you promised me 10s. Mr. Carman said, "You do not think I am going to give you 10s. and not know whether it is done or not;" and then we went away. He gave us a note, and we afterwards went over to Phillips and Carman, jun., to see how they were getting on. Phillips told us that he had taken it, and the readings of the index which he had taken, and he showed it to Mr. Horton. I did not hear the conversation, and I cannot say that I should know the paper again. I saw one at the Police Court which very much resembles it, but it has been added to a great deal. When we came away Horton told Mr. Phillips that he had not done the job, and he said that he had not pierced the meter, and he said he would get some other tools. Mr. Phillips always took an active part with regard to the meter, and the paper of the readings was in Mr. Phillips's possession. After Horton's saying he would get some other tools, I went with him to Regent-street to a man whom I have not named, and he told me of Underhill. From Underhill he borrowed two drills. Horton said the tools that were borrowed were the sort of things, and he used one of them on a penny piece and other metals to try the efficacy of it. On getting home to his lodgings he found that he had a little trouble with the meter, and he said that this was just the thing to do the job. Before we went to the club again we went to Mr. Carman, sen., and Horton showed him the two drills he had obtained. We went to the club on the following day, but I do not know whether our intention to do so was mentioned to Mr. Carman or not. On reaching the club we saw Mr. Carman, sen., and Horton had the two drills and the awl with him, and a hammer. Phillips was only absent on one occasion that we went over there, but I cannot fix which occasion it was. We went up to the meter as before, and Horton unscrewed the plug and introduced his stabling awl, and struck the meter with a hammer, and he said, "That is the way to do it." He then heard the gas whistle out through the hole. It came out from the overflow plug with a whistling noise. We replaced the screw and filled it up with water. Horton then went and spoke to Mr. Carman, jun., and we came down, but I did not hear the conversation. We went to the Grapes the same night, Horton having said from Mr. Carman, sen., that he did not see it written. We went back to the club a few days after to see what effect had been produced. Phillips was there, and showed a paper to Horton, and Horton said, "Yes, there is an apparent saving of some 4s. on the 12th." This following the piercing of the meter they had only burnt 600 feet of gas each, and that was an apparent saving. Phillips said that they certainly had burnt less, according to the reading. He showed Horton that on some nights they had burnt only a small quantity, but on other nights it was greater. I am unable to identify the paper, but the figures as indicated upon the same paper, added to the time from time. Whenever I wanted money he always went to the Grapes; it may have been possibly half-a-dozen or a dozen times that I went with him. Sometimes Mr. Carman was not at the Grapes when we went there, and then Horton would wait or go again in the evening. I have never more got to see Mr. Carman on several occasions. Horton always demanded money, and generally Mr. Carman gave him. On one occasion Mr. Carman was very angry with Horton when he went over and demanded money. Mr. Carman said he had only agreed to give him 2s. I think it was. Horton said, "No; 4s was the agreement," and there was a great deal of talk. Horton never recollected whether he received any money or not on that occasion. About the end of the month Mr. Liversy, one of the officials of the South Metropolitan Gas Company. He took me to Mr. Howard, and I made a statement to him. The next day, by the direction of Mr. Howard, I saw Mr. Washington, the Solicitor, and made a further statement to him. I do not know that the meter which I saw operated had been moved from the New Kent Club. I am not acquainted with the manufacture of gas-meters, but I know the difference between a wet and a dry meter. On each occasion at the Police Court I saw the meter that was at the New Kent Club, after it had been taken to pieces, and examined by Mr. Detheridge. I made my statement before I saw the meter.

Cross-examined by Mr. WILLIAMS: The first time that I went to the Grapes I was a perfect stranger to Mr. Carman. It was on the occasion of a second visit that Horton told Mr. Carman he could save him a great deal of gas, and he had a meter that he had made. Horton said, "I saw it; but without further observation he said not to ask him about it; you. I have not a wet meter, but I know a place over the water where they consume a quantity of gas." I never had a shilling of the money paid to me from Carman. I never asked Horton for a part of the money received from Carman. The Grapes was a public house, and a gas not burning properly. I remember hearing Phillips say to Horton that a fitter had been to see to the gas, but I forget when it was. I had a quarrel with Horton eight or ten days before I made the statement to the Gas Company. I never denied Mr. Carman to give me any money. I understood, as the plan developed itself, that it was a conspiracy to defraud; but I did not know I was committing a criminal offence and was subject to prosecution.

Mr. WILLIAMS: I presume your quarrel with Horton had nothing to do with your going to the Grapes to see Mr. Carman and making this statement?

Witness: Yes, it had. I did it to spite Horton; it had nothing to do with furthering the ends of justice.

Cross-examination continued: I am now working for the Gas Company. They have employed me ever since I went to them and made this statement.

In re-examination by Mr. BESLEY, witness gave some particulars as to his quarrel with Horton, and his previous connection with him. John Rollins, a blacksmith, deposed to having known Allen and Horton, and as to their having come to the shop where he was employed and borrowed a file, as witness had before. Magistrate. John Jenner Saltmarsh, a billiard-table keeper in the Station Road, deposed to the knowledge of the laddie; and Samuel John Underhill to the laddie of the small flies and the punch. Evidence was also given by Charles Wilson, the proprietor of the New Kent Club, as to Carman, sen., entering upon the tenancy of the premises in May last, when a 20-light meter was put up. He stated that

he was in the club when Horton and Allen were there at work on the meter. Mr. Carman had complained to him of insufficiency of light, and of the lights jutting, and he had noticed a flickering every evening from the time the wet meter was fixed till the dry one was put up on the 13th of July.

Mr. Charles Howard, Chief Inspector of the South Metropolitan Gas Company, examined by Mr. BESLEY, said: I remember Allen calling to see me, he having previously seen Mr. G. Liversy, the Secretary of the Company. He made a statement, upon which, before communicating with any one at the New Kent Club, I gave directions for the meter to be taken away and another to be placed there. It was the South Metropolitan Company's meter. Before meters can be used they have to be stamped by an officer appointed by the Board of Gas Works, who is called the Gas Inspector. Mr. Detheridge, Mr. Detheridge's name is Detheridge. Every meter is numbered and stamped. I gave directions for the meter to be taken away from the club direct to Mr. Detheridge's, and I saw it on the following day. Mr. Detheridge was present. At that time it was being tried, and there was a light attached to it. It was present at the time I saw it. Upon trial the meter registered correctly, and as reported by Mr. Detheridge. Mr. Detheridge told me it was correct, and on the 14th of July a triangular piece was knocked away. The meter produced is a wet meter, and when perfect this triangular piece [produced] is withdrawn. With the meter there is a drum inside of the meter. A small meter with a glass back was produced to show the drum. In a wet meter the water should reach the waste-pipe. When a meter is properly charged, the water should just reach the top of that [pointing], and if there is more it then falls into the waste-box below. If there is more than that, the water will overflow, and the drum would be under water. It revolves by the pressure of the gas, which is admitted by the inlet-pipe. When the drum is perfect, the gas passes through the inlet-pipe into the meter, and the meter is charged with gas as far as the water-line I have described. At the waste-pipe there are no valves, and the gas passes through the meter as back. As the drum revolves it moves this spindle [pointing], and that spindle turns the hands of the index. This is the waste-box, and this the waste-pipe. This plug can be easily removed, and by putting in a brassawl or drill it comes against the guard. I am unable to say within what period of time we have had the meter. The meter is a dry meter, and the meters made without such a guard as this. The waste-water box would be charged with gas up to the plug. The perforation of the guard would immediately allow the gas to escape into the hole. If the drum had been perforated through this hole, it would have been invisible, and when the meter was in the gas, the gas would do as the gas passed through the meter, when the lower portion of it had made a revolution the hole in the drum would allow the gas to escape unregistered through the outlet as long as the hole was above the water-line. The larger the hole the more gas would pass unregistered—some would pass with every revolution. Our inspectors are not allowed to make any alterations in the meter, and the quarter, for the purpose of making up our accounts, and at the half quarter as well. The inspector might possibly find out that the drum was perforated from the fact of there being a very large quantity of water, but he might pass it over if he were not an experienced man. I do not think that the meter was tampered with. The meter was not tampered with any perforation or tampering with the meter in any way, owing to the plug having been taken off and replaced. The consumption of gas in billiard-rooms would vary according to the amount of play going on. The diminution in the amount to be charged from the readings of the index would be the gas supplied to this club until after the discovery was made, and the meter had been taken away. We keep a register of complaints, and I have examined it carefully. This meter [produced] is a dry one. When the inlet and outlet pipes are connected with this meter, there is no access to the interior of the meter. It can only be tampered with by opening the meter here [pointing], and then the gas is put to perforation with an awl or drill it would be seen inside. There is no such thing as a drum in a dry meter. [Witness produced the inside of a dry meter, and explained to the jury the manner in which the gas passed through.] I saw the triangular piece taken off the meter. The meter was in a small state of repair, and was taken to Mr. Detheridge's. I am unable to say as to Allen's statement, but when I arrived there we discovered a small indentation through the hole. The guard was perforated. There were two holes, and the sign of a third. Those holes could be made with such instruments as the brassawl and the wire file produced. If there would be some difficulty in doing it with the file, as it would be more likely to bend than to make the perforation. The drum was not perforated, and no gas could pass through unregistered. When anything is the matter with a meter, the people write to the Gas Company, and we give no gas-fitter in our district permission to touch a meter; in fact, we prosecute them for so doing. Upon complaints being made of gas flickering, we send a man to attend to the matter. We do not charge anything for it, and as far as the meter goes we keep it in repair, and the supply-pipes too. It would be quite unnecessary, under any circumstances, to take off the plug and perforate two holes in the guard, and no one would think of doing it. In a meter, the state of the drum is not the only thing that is taken into account, and then it would only be necessary to remove the plug and let the water out. The stabling awl and perforation could have no possible object except to let out the gas.

Cross-examined by Mr. WILLIAMS: Supposing the drum had been perforated with such a hole as that on the outside guard, I cannot form any notion as to how many feet of gas would be lost in the course of a quarter; it would depend upon how many hours a day it was burning.

Re-examined by Mr. BESLEY: I have tested this hole, and find that it would pass 9 feet an hour. Ten hours a day for gas to be burning in a billiard-rooms would not be a very small quantity.

George Frederick Beaverton and John Mathers, both in the employment of the Company, deposed to removing the meter from No. 9, Station Road, and putting up another in its place.

Mr. George Detheridge, examined by Mr. MRW, said he was the official Inspector of Meters for the district, and the meter produced was brought to him on the 13th of July and placed under lock and key. He had heard the evidence given by Mr. Howard, and agreed with what he had said.

George Hewes, a clerk in the employ of the Company, repeated his evidence given before the Magistrate as to receiving a letter from Mr. Detheridge, and the letter stating that the water getting into the gas-fittings, and his determination to have a dry meter.

The prisoners statements when before the Magistrate were then put in, and

Mr. BESLEY summed up the case for the prosecution, stating that he

wished to do nothing but assist the jury in arriving at a proper conclusion, because the Gas Company had no partisanship or feeling in the matter, and no one who had seen Mr. Howard, as representing the gas company, could say that the action he had taken was other than a duty imposed upon him. He pointed out that the temptation to defraud Gas Companies was somewhat different from the temptation to defraud an ordinary salesman, because in the latter case the articles were weighed or measured in the presence of both parties; but in the case of the sale of gas the "scales" were entrusted to the buyer, as provided by the statutes, and the companies were therefore somewhat in the power of the consumers. Therefore to take advantage of a gas company was not only a felony or a fraud, but a cowardly thing to do. The Legislature gave certain protection to the consumer, and imposed certain duties on them. Starting with that, he asked what was the answer to Mr. Allen's disclosures? The sole answer was that he was a disreputable person, but in his (Mr. Besley's) view this was not sufficient to warrant them in acquitting the prisoners. He pointed out that there had been no material variation in the statements made by Allen to Mr. Howard and Mr. Washington (the Company's Solicitor), at the Police Court and upon the present occasion, and dwelt on the improbability of Horton's visit to the club having been for the purpose of legitimately attending to the meter, as he, having served an apprenticeship to the meter-making business, knew perfectly well he had no right to touch a meter, while if any ordinary gas-fitting was required it was not likely that a workman would be sent from Windmill Street to the Elephant and Castle for the purpose, but a fitter on the spot would have been engaged. At some length he mentioned the various points of confirmation of Allen's statements, and directed special attention to the condition of the meter as the strongest element of confirmation, and also to the fact that on the guard being pierced there would be a whistling noise, as described by Allen, and which none but a skilled witness like Mr. Howard would have knowledge of. He defended the action of the Gas Company in having since employed Allen, and explained his own motives in recommending him to the jury. He concluded by asking the jury to look at the question as one of evidence simply, and if they thought the evidence bore more in favour of any of the prisoners than others, especially Phillips, to give them the benefit of any doubt they might have.

Mr. J. WATSON addressed the jury on behalf of the prisoners Carman, and, referred to considerable length to the past history of Allen, and to urge that his evidence was not worthy of credit, especially as he confessed he was animated with the idea of spitting Horton. He contended that all the points of confirmation urged by Mr. Besley were thoroughly confirmed with the direct innuendo of the prisoners. Mr. Besley had suggested that they might let Phillips go, and convict the rest; but they could not do this, because if Allen's story was true all were alike guilty, while if it was not true none of them were guilty. He made special allusion to the fact that everything was done openly and in view of any one who might come into the place, and he urged them to acquit the whole matter disclosed by Horton's statements before the Magistrate, which he contended was the more probable, and not by their verdict sacrifice the character and liberty and almost the life of his clients.

Mr. J. WATSON said that, representing Phillips, he was loth to occupy much time in addressing the jury upon the facts of the case, as he also thought that the prosecution of the client had been virtually abandoned. Mr. Besley started by pointing out that Phillips could have no motive for conspiring to commit the crime, and after indicating precisely the position he occupied in the business as manager, not having the same motive for defrauding the Gas Company as the two Carman's had, he went on to tell the jury that they must have very strict evidence of his guilt. Judging of the course the case had taken, he did not think it necessary to speak as to the facts, and therefore would propose only to call witnesses to character, and having called the witnesses he was sure he might safely leave Phillips's case in their hands.

Mr. LYON also addressed the jury on behalf of Horton, alleging that the story of the plot was a deliberate fabrication on the part of Allen to spite Horton, and he had been ingenious enough to include in the charge the only men who would have had the means of going into the witness-box to contradict his assertions. He remained upon the general motive for the conspiracy, and alleged that the utmost saving that could have been effected being but 33s. a quarter, while discovery could not possibly be long delayed.

Numerous witnesses were then called who bore testimony to the good character for honesty and respectability which the Carman's and Phillips possessed, and, after Mr. Howard was recalled, and, in answer to the CHAIRMAN, stated that if the drum of a meter were pierced the water would not go into the perforated part and stop the meter from working, as the drum always worked in water. Taking the water out of the meter would not stop the flickering, which arose from water in the service-pipe—most probably water condensed in the service-pipe. If the meter were overcharged with water, taking away the surplus would stop the flickering.

The CHAIRMAN then summed up the whole case to the jury, reminding them that the question of character had nothing to do with the case before them. As to the allegation that the meter was out of order, they must assume that the consumer, and especially so large a consumer as Mr. Carman, sen., was, knew that only the Company had a right to interfere with the meter, for it was almost a matter of common knowledge with persons who consume gas. Having directed the jury that they must have contradictory evidence in the process of proof, he then led them to particulars this confirmation had been afforded by the evidence, and remarked that the fact that the prisoners had not succeeded in their attempt to defraud the Company, if the attempt was made, should not influence their decision. As to the plea that there was little or no motive, he said they are the only persons who could be supposed to lead them to know upon what very small inducements people would sacrifice the character of a lifetime; and the simple question for them to consider was whether they believed that the defendants did conspire to defraud the Company. He then directed the jury relating to conspiracy, and directed them to consider whether the younger Carman, being under the control and influence of his father, was a person so guilty as the others. With regard to Phillips, if they believed Allen's story, he was concerned in the matter too, but must be found guilty at their hands, although it must be admitted that he had no adequate motive for joining in the conspiracy. The jury then retired, and were absent more than an hour. Upon their return the Foreman announced that they had found Carman, sen., and Horton "Guilty," and Phillips and the younger Carman "Not Guilty."

The CHAIRMAN then sentenced Carman to three months and Horton to four months imprisonment.

MONDAY, SEPT. 13.

Mr. LYON to-day applied to the Court for a mitigation of the sentence on behalf of Carman. He said the prisoners were the father of a family of six young children, who were entirely dependent upon him for support. He had been recommended to mercy by the jury, who had all signed a petition to the Court in favour of a mitigation of the sentence, and as the

offence was one which was punishable by fine, the learned counsel hoped the Chairman would modify the sentence.

The CHAIRMAN said in his opinion the jury had strained a point in favour of the prisoner in recommending him to mercy. In his opinion the prisoner was fortunate in escaping hard labour, and, having regard to all the circumstances, the Court could not alter the sentence which had been inflicted in the case.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

It is stated that, in consequence of the report made to Parliament last session by the Select Committee on London Water Supply, the eight Companies have agreed to oppose, as one body, any scheme which the Government may bring forward for the purchase of all, or any, of their undertakings.

The Registrar-General publishes the following table in reference to the water supply of London during August. According to returns furnished to him by the Metropolitan Water Companies, 151,766,051 gallons, or 689,543 cubic metres of water (equal to about as many tons by measure, tons by weight), were supplied daily, or 256 gallons (116.6 decalitres), for each more than one person by weight, to each house and factory (16.6 decalitres) to each person, against 34.8 gallons during August, 1879.

COMPANIES.	Number of Houses, &c., supplied in Aug., 1879.	Aug., 1880.	Aver. Daily Supply of Water in Gallons* during Aug., 1879.	Aug., 1880.
Total supply	567,920	592,163	140,256,771	151,766,051
From Thames	770,925	283,831	71,426,330	76,252,909
„ Lea and other Sources	286,995	308,329	68,824,451	75,513,106
THAMES.				
Chelsea	29,000	30,071	8,921,600	9,576,200
West Middlesex	29,744	35,304	10,992,540	11,661,450
Southwark and Vauxhall	68,927	91,165	24,667,853	25,601,283
Grand Junction	39,698	42,491	12,544,180	13,565,321
Lambeth	61,908	64,903	14,499,300	16,369,600
LEA AND OTHER SOURCES.				
New River	128,700	131,425	29,902,000	31,343,000
East London	120,459	126,752	31,208,800	33,139,000
Kent	47,827	50,152	8,715,651	9,931,106

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for August, 1880, as compared with that for the corresponding month 1879, shows an increase of 24,243 houses, and of 11,513,214 gallons of water supplied daily.

The following is Dr. Frankland's report of his analyses of the water supplied to London during August.—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Kent, 1.6; Colne Valley, 1.6; Tottenham, 1.6; New River, 3.1; Chelsea, 1.1; Grand Junction, 5.8; West Middlesex, 6.7; East London, 7.0; Southwark, 7.1; Lambeth, 7.8. The Thames water supplied to London was of very bad quality, that of the Chelsea and Grand Junction Companies being also slightly turbid; but the water of the West Middlesex, Southwark, and Lambeth Companies, though efficiently filtered, was quite unfit for domestic purposes, owing to the large quantity of organic matter which it contained. The Lea water distributed by the East London Company, though efficiently filtered, was no better than Thames water; but that sent out by the New River Company, though inferior to the supply in July, was much better than that of any other Company drawing from a river. The deep-well water supplied by the Kent and Colne Valley Companies and by the Tottenham Local Board of Health was of its usual excellent quality for domestic purposes, and that sent out by the Colne Valley Company was suitable for all domestic purposes, having been subjected to heavy delivery. On the other hand, the water presented the following appearances—Kent, Colne Valley, and Tottenham, clear and colourless; New River, clear and pale yellow; Chelsea, Southwark, Lambeth, and East London, clear and yellow; West Middlesex and Grand Junction, slightly turbid and yellow. The temperature of the river waters drawn from the mains was very high, ranging from 17.2° C. (63° Fahr.) to 20° C. (68° Fahr.). At these temperatures the water is rapid and unpalatable. The deep-well waters maintained a much lower temperature, ranging from 12.2° C. (54° Fahr.) to 13.5° C. (56° Fahr.)."

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solids—Mat- ters.	Or- ganic Carbon.	Or- ganic Nitro- gen.	Ammonia.	Nitrogen, as Ni- trates and Nitrites.	Total Chlorine.	Total Hard- ness.
Inner Circle.							
Thames—							
Chelsea	25.76	.230	.649	0	.116	.165	1.5
West Middlesex	28.26	.341	.058	0	.112	.195	1.5
Southwark	28.12	.369	.059	0	.144	.203	1.5
Grand Junction	28.10	.274	.067	0	.142	.200	1.5
Lambeth	30.10	.404	.058	0	.166	.234	1.5
Lea—							
New River	27.02	.118	.056	0	.163	.199	1.6
East London	25.14	.339	.052	0	.096	.148	1.6
Deep wells—Kent	43.92	.078	.014	.002	.389	.405	2.3
Outer Circle.							
Colne Valley	11.98	.077	.017	0	.314	.331	1.4
Tottenham Local Board	10.76	.081	.016	0	.063	.29	1.7
Corporation of Birming- ham	22.76	.259	.027	.003	.216	.245	1.8
Corporation of Glasgow	2.90	.159	.015	0	.006	.021	.6

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough. † Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Wilson Tavern, Aldersgate Street, E.C., on Thursday last—Professor ENKASSUR, F.R.S., in the chair. Mr. Magnus Ohren, Assoc. M. Inst. C.E.S., having read the notice convening the meeting, the following report and the statement of accounts were taken as read:—

The Directors report that the general working of the Company during the half year has been satisfactory.

Dr.		REVENUE ACCOUNT, for the		Cr.	
To Manufacture of gas—					
Coals, including all expenses		£19,349	11	3	
Purifying materials, wages, &c.		1,026	1	9	
Salaries of Engineer and Officers		696	5	8	
Wages and gratuities		3,446	17	8	
Works, machines, and retorts—					
maintenance of, repairs, and labour		\$5,087	13	8	
Less old material		29	6	3	
			5,058	12	5
				£29,387	11
Distribution of gas—					
Salaries of Chief Inspector, Inspectors, and Clerks in Light Office		£738	13	2	
Mains and service-pipes, repairs, maintenance, renewal, and labour		1,295	15	3	
Meters and gas-stoves, repairing and renewing, &c.		1,362	2	4	
				3,396	15
Public lamps—					
Lighting and repairing				739	13
Rents, rates, and taxes—					
Rent		£30	6	10	
Rates and taxes		1,736	12	0	
				1,766	18
Management—					
Directors' allowances		£750	0	0	
Salaries of Secretary, Accountant, Clerks, and Messenger		582	11	4	
Collectors' commission		360	11	2	
Stationery and printing		282	8	4	
General establishment charges		346	6	5	
Auditors		50	0	0	
				3,981	0
Sundries—					
Law and parliamentary charges				7	12
Bad debts				265	5
Insurance-fund				212	10
Horses and carts				9	3
Total expenditure				£38,766	12
Balance carried to profit and loss account				15,859	0
				£52,625	12

PROFIT AND LOSS ACCOUNT (NET REVENUE).

To Received fund account, amount carried from the half year's profits	£2,500	0	0
Balance of net profit to be carried to next account, subject to half year's dividends to June 30	12,827	3	10
	£15,327	3	10

The price of gas has been reduced to the general consumer to 3s. 8d. per 1000 cubic feet from the last Midsummer quarter.

The reports of the Gas Examiners of the parishes supplied by the Company, as to the illuminating power of the gas and its freedom from sulphuretted hydrogen and ammonia, continue to be satisfactory.

The Directors recommend the declaration of a dividend for the half year ending the 30th of June last at the following rates per annum—viz., 6 per cent. on the preference stock, 7 per cent. on the ordinary 7 per cent. stock, 10 per cent. on the ordinary 10 per cent. stock, and 7 per cent. on the new ordinary 7 per cent. shares, all less income-tax. This will amount to £10,171 14s. 2d., and the sum of £1755 9s. 8d. will be carried forward to the profit of the succeeding half year.

Half Year ended June 30, 1880.		Cr.
By Sale of gas—		
Private rental—		
Lady-day quarter—		
At 3s. 7d. and 3s. 8d. per 1000 cubic feet	£25,456	10 3
Midsummer quarter—		
At 3s. 7d. and 3s. 8d. per 1000 cubic feet	12,256	5 7
Private rental, the half year	£37,713	1 10
Public rental, the half year, on 1835 lamps.	3,996	10 11
Gas rental	£41,649	12 9
Rental of meters—		
Rental for the half year	623	17 11
Total rental	£42,273	10 8
Residual products—		
Coke, less labour and cartage.	£6,706	6 7
Breeze	223	2 7
Tar	889	14 5
Sundries	4	8 6
	£7,833	12 1
Sulphate and ammoniacal liquor, less acid, labour, repairs, &c.	2,419	11 9
Rents	10,253	3 10
	98	18 1
Total receipts	£52,625	12 7

By Balance of net profit from last account	£11,986	11	4
Less dividend paid for the half year ended the 31st of December	10,634	10	4
	£1,352	1	0
Balance from revenue account, being profit for the half year	13,859	0	2
Interest on deposits	116	2	8
	£15,327	3	10

The CHAIRMAN, in moving the adoption of the report, remarked that he might venture to say that it was, as usual, of a gratifying character, and the Directors were enabled to state to the Shareholders that the Company's business in every way was proceeding in a perfectly satisfactory manner. He might almost congratulate them on the small number of Proprietors assembled on the occasion, for, perhaps, one of the best proofs of the confidence they had in the stability of the undertaking, and of the harmony which was likely to prevail at the meeting. He might also hope that the profits of the Company had in a certain degree induced some of the Shareholders to remain out of town, in lieu of coming into close London to attend the meeting. He regretted that they would be deprived of the pleasure of the attendance of one of the Auditors on this occasion, as he was in one of the Western Islands of Scotland, in a part where gas was more highly considered and more highly valued than it was among ourselves. Custom and habit, he supposed, had rendered us less capable of appreciating that great blessing to society. They found that his (the Chairman's) countrymen, the Scots, who were not always celebrated for their liberality, but looked twice at a "baubee" before they spent it, were nevertheless content to pay 9s. 10d. per 1000 feet for their gas in the part where their Auditor was staying. The Directors only regretted that this Company's consumers were not there, instead of being where they were, provided they were in sufficient number to remunerate the Company for their production. The Shareholders would have observed that the Directors were doing what they had done almost from the beginning—reducing the price of gas to the consumers. They had always considered that the amount of profit was in satisfying the consumer, in attending to his wants and interests; and therefore whenever the opportunity had been given to reduce the price of their gas, they had gladly availed themselves of it. There were circumstances which naturally prevented them from being as low in price as some other companies. Their position as it were, extra-Metropolitan company, their provincial district, the peculiar characteristics of their district—its high hills and low valleys—and a number of other things, rendered the cost of the production and distribution of their gas greater than would be the case in cities and in centres; and more particularly the divided position of the population, who, instead of congregating in streets, were more healthy and more happily distributed between intervening spaces of ground. The Directors still exerted themselves to keep up the purity of the gas to a satisfactory standard, and also its illuminating power; and the last paragraph in the report showed that the amount of profits was what the Shareholders had been accustomed to for some years, and enabled them to satisfy their dividends at the maximum. He thought he need not say anything further with regard to the Company. The works were now in good order, and were capable of any future increase that might happen to be required. The Company had land to spare, on which they could extend their plant and works; and, on the whole, their position was just as satisfactory now as it was at the very beginning; and they would be prepared for any amount of increase in the consumption which might manifest itself in the district.

Mr. F. L. LINGRO seconded the motion.

Mr. R. H. JONES said there were so many good features in the report and accounts that one had a difficulty in finding fault, and it was far from his desire to do so. At the same time there were one or two points which required a little explanation. The cost of purifying seemed very high, for which, however, the Directors had, no doubt, sufficient explanation—that they were under peculiar circumstances, which had rendered it necessary for them to spend £1028 in the half year for purification. Another item he felt interested in as a consumer was the bad debts, which seemed very heavy compared with the accounts of other companies. Comparing the Company with the Brighton and Hove Company, which he said, was somewhat similarly situated, their bad debts should be about £150 in the half of £295. He also noticed that there was a considerable falling-off in the residuals—about £1500. These items, no doubt, were unavoidable; but at the same time one could not but notice them in glancing through the accounts. On the other hand, there were some very promising features. Their make of gas per ton of coal carbonized was good.

The CHAIRMAN said he was very glad that Mr. Jones had called attention to the items referred to, because he was sure the Directors would be able to give the Shareholders a thoroughly satisfactory explanation.

Dr. FUELLE said that the Chairman had stated that the position of the Company now was as satisfactory as at the commencement. When the Company was first established, however, they had the power to charge 6s. per 1000 feet, whereas according to the report the price was reduced to 3s. 8d. per 1000, and there were many consumers in the district who, when the Company was first established, had they heard the Chairman's remarks, would he thought, agree with him (Dr. Fuelle) that instead of paying 6s. per 1000, it was very much more satisfactory to have to pay only 3s. 8d. Therefore, although, as regarded the position of the Shareholders, their dividends had always been fully maintained, he held that as regarded the public their position as to this Company had been very greatly improved, and that the reduction to 3s. 8d. per 1000 feet was a matter for which the consumer had to thank the Board, as it arose from the very able manner in which they had managed the affairs of the Company. He had complimented the Board on previous occasions for the manner in which they had placed the accounts in the hands of the Shareholders, and he had further to compliment them on having made them more perfect. The insertion of the statement of gas made and sold gave a very fair indication of the affairs of the Company, as far as the engineering department was concerned; and it was most satisfactory to find that over 10,000 cubic feet of gas had been obtained for every ton of coal carbonized. This showed that there was a very good head in the engineering department. It was also very satisfactory to find that, in a district in which the levels were so difficult, the unaccounted-for gas was not more than 51 per cent. of the quantity manufactured. They must congratulate themselves not only on the maintenance, as usual, of the full dividends, but on the fact that the Company had accumulated in the past twelve months a sum of about £8000, which had been placed to the various reserve, contingent, and insurance funds. Those funds now amounted to within £5000 of the total sum at which they could stand by the Company's statutory obligations, and this being so the Directors had felt themselves bound to reduce the price of gas. There was one matter of regret in connection with the Company—that two years ago it was not in the financial condition that it could apply for power to raise additional capital. He had no doubt that they could have been placed under the sliding scale at 4s. 2d. per 1000, as the adjoining Company was at 4s. 7d., and if they could have shown the Shareholders would probably have been receiving 11s. and 8s. per cent. instead of 10 and 7 per cent. It was therefore rather unfortunate that the very prosperity of the Company might one day, when they went to Parliament for more money, be the means of placing their capital at a low sliding scale. There was, however, a large amount of capital still

unexpended. He congratulated his brother Shareholders on the prosperity of the Company, and thought that the Directors were worthy of the warmest thanks for having done so much in placing them in such a good position, and at the same time conferring such great benefit on the public.

The DEPUTY-CHAIRMAN (Mr. H. P. Stephenson) said with regard to Dr. Puckle's remark about their going to Parliament, he had every reason to hope and believe that they would require to go to Parliament for more capital for some twelve or fifteen years to come, and even if they had to go now he individually believed—and he believed his co-Directors almost unanimously agreed with him—that they would rather be under their Act with the 6s. maximum price of gas, paying 10 per cent. dividend, than a maximum, now under Act with a low initial price and paying a higher dividend. He wanted to warn the Shareholders against seeing 11½ per cent. dangling before their eyes and trying to persuade themselves that they preferred 11½ per cent. to 10 per cent. It was all very well at the present moment, though the 11½ per cent. was only a mirage, the business of the country generally in a depressed condition; but if the iron industry of the country and business generally prospered, would it be the immediate effect on the coal market? Why, that coals would go up, and the result of this to the gas companies would be that their profits would considerably diminish—he did not say wholly attributable to the rise in coals—and then possibly if they had been paying 11½ or 12 per cent. on their initial price they would find themselves compelled to reduce the dividend or raise the price of gas, and then the sliding scale cut the other way. If for every penny decrease in the price they obtained one quarter per cent. more dividend, on the other hand every penny increase in the price would be deducted one quarter per cent. on that which they already had; and he should be very sorry to meet the Shareholders of the Company with a 9½ or 9 per cent. dividend. He therefore hoped they would be contented with the maximum dividend which they could so clearly pay, rather than a mirage, though he knew that others did not believe in it, and he believed to a certain extent a demoralizing effect on the directors of a company, because it tended to induce them to place more to capital account than they would otherwise do. He did not think the full effect of the sliding scale had been thoroughly gone into. It had the demoralizing effect he had referred to, though he was not sure that directors would be decided by it; and the complaint in times past against gas companies had been that they charged more to capital account than they ought to, to put more into the shareholders' pockets. He held that the sliding scale had the same effect—putting more to capital account, and so increasing the dividend to the shareholders. There was his own opinion, though he knew that others held different views. With regard to his own remarks of Mr. Jones, the cost of purification was high, no doubt, and it arose in this way: They were under a 20-grain limit for sulphur compounds, and not only had they to use a large quantity of lime to keep free from fines under this limit, but also in order to keep free from nuisance they had to pay a very large sum and make special arrangements to take away the waste lime, which was a very ugly material—sulphide of calcium. He only hoped they would always be able to get rid of it on the same terms as at present—by paying for it. As to the bad debts, they were a little high, but the Directors had taken every precaution to reduce them as far as possible. He thought the Shareholders would see that it was a fair collection. When he told them that, as a general rule, they collected over 98 per cent. of their quarter's charges within the quarter. That was not a very bad collection. Of the remainder, about 2 per cent. it was perhaps unfortunate that more of it represented bad debts than ought to be the case. He did not think the results obtained from the residuals was master of complaint against the Company, for every one connected with gas companies knew that coke especially, and residuals generally, during the last half year had been considerably lower in price than in the corresponding period last year. The objection was then put and carried unanimously.

The DEPUTY-CHAIRMAN next moved the declaration of the dividends mentioned in the report.

Mr. C. LEA Wilson seconded the motion, and it was also carried unanimously.

Mr. R. J. S. BAZZON moved a vote of thanks to the Directors for their able management of the Company's affairs.

Dr. PUCKLE seconded the motion, and it was unanimously agreed to. The CHAIRMAN, in acknowledging the compliment, said the only matter on which the Directors felt any doubt was whether they ought to accept it, as they had only done their duty. Continuing, he proposed a vote of thanks to the gentlemen who were in the chair, and who were doing so in a great measure dependent, and warmly eulogized the services of the Auditors, the Engineer, the Secretary, and Mr. Arliss, the Chief Clerk, referring to the great interest taken by Mr. Ohren in local affairs, and the esteem in which he was generally held.

Mr. B. H. JONES, in seconding the motion, thanked the Deputy-Chairman for replying to the observations he had made.

The motion was carried unanimously. Mr. JAMES GLAISHER, F.R.S. (one of the Auditors), responded, and said he certainly thought that the officers did their best. He would like to treat this opportunity as saying what was scarce it was valued as a high price. When he was at Grasmere recently he asked what was being paid for gas, and was informed that it cost about 12s. or 14s. per 1000 feet. His informant added that he would use it, even if it cost more, on account of its cleanliness, safety, and other advantages.

The CHAIRMAN then rose, and then passed and acknowledged, and the proceedings terminated.

BRISTOL UNITED GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held on Wednesday last, the 17th inst., in the Chair.

The SECRETARY (Mr. H. H. Townsend) having read the notice convening the meeting, the Directors reported (which recommended a dividend at the rate of 10 per cent. per annum), together with the half year's accounts, was presented.

The CHAIRMAN, in moving the adoption of the report, referred to the loss the Directors had sustained by the death of Mr. T. T. Taylor, who had been upon the Board of the Company for 16 or 17 years, and during the past five or six years had filled the post of Deputy-Chairman. The vacancy thus caused had, he said, been filled up by the appointment of Mr. W. Spark of the office. Mr. Spark was well known to all the Proprietors, and his business habits induced the Directors to believe that they would get on as well as they had hitherto done. The accounts before the meeting showed a falling-off in the revenue for the past half year, but this might be accounted for by the fluctuations in the price of gas. The Directors, however, as always found, as a natural consequence of their making a reduction in the price of gas, that their receipts for the ensuing half year diminished. The reduction had been made to the general consumer as well as to the Sanitary Authority for the public lamps, and he had no doubt the deficiency that had arisen would be again made up in the coming half year. At the new works at Stapleton a large trade had been created. He had always been of opinion that two gasholders would be better than one there. It was not impossible, although improbable, that some accident might arise;

but if anything happened to one of the gasholders they would now have another ready for any emergency. The demand for gas in the Stapleton neighborhood was very great; it was rapidly increasing year by year, and had been growing to a very great extent for the last six months. Of course nothing could be done without expense, and to meet the cost of the extension of the works and other matters the Directors intended offering for sale 30,000 tons of stock.

Mr. W. SPARK seconded the motion. He was sorry he had been called upon to supply the place of Mr. Taylor, than whom there could not have been a more honourable and upright man. He hoped he should do his duty towards the Company, whose affairs were in a prosperous condition, although there had been a diminution in the last half year's receipts. He had done so, and he thought the Committee on would put them in the position they were in before—able to meet all the demands made upon them in dividend and in every way.

Mr. L. W. GILES observed that the Sanitary Authority had been again raising the question as to the price of gas. The Chairman of that body seemed to have appreciated the fact that the difference was not so much between the Gas Company and the Authority as between the Gas Company and the public. The question was whether the Gas Company were charging a fair price for the gas. He thought the accounts showed that they were not charging an unfair price. With a capital of £455,000 they had earned out £15,600; that was to say, they had earned less than 3 per cent. profit upon their return last half year, which clearly showed that they were not behaving unfairly towards the consumers. It could not be too often put before the public that the Company were not charging an unfair price, and that the return on their capital investment was not too low. It was not allowed to get 2 per cent. out of a successful enterprise, there might as well be an end of public enterprise altogether. He regretted that the Directors did not intend to fill up the vacancy in the directorate caused by the death of Mr. Taylor. He should like the Board to consist of 10 or 12 members, because Mr. Jones would give the public greater assistance in dealing with the question of the public light. He hoped, therefore, the Directors would see their way clear to fill the vacancy as quickly as possible.

The CHAIRMAN said the reason why the vacancy had not been filled up was because it was generally found that the business was better done by a smaller number.

The motion was carried unanimously, and the dividend recommended was declared.

The retiring Directors, Messrs. F. Terrell and J. Lucas, were re-elected, and Mr. W. Tribe was again appointed Auditor.

The proceedings closed with the customary compliment to the Chairman.

DOVER GASLIGHT COMPANY.

The Half-Yearly General Meeting of this Company was held on Tuesday, the 17th inst.—Mr. W. G. FIELDING in the Chair.

The SECRETARY (Mr. G. Fielding) read the notice of meeting, and the following report of the Directors was presented:—

We now lay before you the accounts for the period closing the third year of the conduct of the Company's business by the direct action of the Board of Directors; and we feel that the results of the working of these three years, as evidenced in the accounts, will bear a very favourable comparison with any other period of the Company's existence. The improvements recently introduced into the manufacturing plant at Buckland have proved to be of a very beneficial character, by enabling a much larger quantity of gas to be made than formerly, without an equivalent increase of expenditure. We hope for still further results in this direction.

In addition to the reduction of 3d. per 1000 cubic feet in the price of gas which we made on the 1st of January, 1878, we have now been enabled to announce a further reduction of 3d. per 1000, as from the 1st day of July last, and this latter reduction will be extended to the public lamps on the 1st of January next, when the new three years contract with the Dover Council will come into operation.

We recommend the declaration of the usual dividend at the rate of 7½ per cent. annum, and the payment of the arrears of dividend for the years 1865 and 1866, and the carrying forward of the balance of the profits and accounts.

Mr. W. MANNING and Henry Stone retire from office as Directors, and Mr. Henry Hayward as Auditor. All three gentlemen are eligible for re-election.

Dr. Profit and Loss Account, for the Half Year to June 30, 1880.		Cr.	
Coals	£1,367 0 7	7 Sale of gas, less discounts and	
Purifying	127 12 11	bad debts	£10,307 5 8
Repairs and maintenance of		Cost of gas, other residuals	£2,510 0 0
gas, meters, mains, &c.		Water and fittings rental	213 18 8
Including labour	2,568 14 2	2 Profits on gas-fittings and	
Lamp	815 11 4	asphalting	114 15 10
Lamp, including, lighting,			
extinguishing, cleaning, &c.	298 2 2		
Rents, rates, and taxes	503 0 8		
Salaries, Collector's commis-			
sion, and Directors	794 18 8		
Interest on loans	155 16 8		
Incidental expenses	99 19 0		
Solicitor's charges	3 13 6		
Balance	3,658 9 10		
	£13,406 0 2		£13,406 0 2

Balance-Sheet, June 30, 1880.			
Capital raised	£200,500 0 0	Cost of works, less depreciation	
Statutory mortgages	10,000 0 0	Bad debts	£71,284 1 3
Premiums on new shares	7,467 0 0	Interest on loans	3,324 1 0
Reserve fund	£151 3 3	Coals, coke, sundry stocks,	
Insurance-fund	973 10 5	and plant	4,111 13 9
Deposits from consumers	365 19 0	Interest on sundries	3 10 0
Sundry liabilities	£36 5 0	Invested in Canadian bonds	973 15 0
Balance	3,658 9 10	Bankers	4,882 18 0
	£200,303 16 10		£200,303 16 10

The CHAIRMAN, in moving the adoption of the report, said that for some few years it had been his pleasure at each meeting of the Shareholders to refer to the satisfactory progress of the Company, but on no former occasion had his remarks been more truthful than on the present. The position of the Company was regarded as a kind of social ism; but these things were now altered. It had been the endeavour of the Directors, by their courtesy, to prove that in the conduct of the Company they all had interests apart from the interests of the great body of their fellow-townsmen; yet, standing there, the mouthpiece of the Company, conscious of there being anything like a clashing of those interests. Turning to the balance-sheet, the Shareholders would see that the Directors had expended £2968 11s. 12d. on repairs and maintenance of works. A large proportion of this sum had been put out in the renewal of plant, necessitated by the advances which science had made, for improved methods of gas manufacture were constantly being devised. The growth of the Company had been most marked, for while in the year 1877 the total quantity of gas manufactured was 97,160,400 cubic feet, during last year it had increased to 1,179,500 cubic feet, and the increase in the consumption of gas amounted to 44 million feet over the year 1877. In addition to this, whereas two or three years ago only about 9400 feet of gas could be made from every ton of coal carbonized, in the past year the average quantity obtained per ton had been 10,060 feet. This had been owing to the

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

The Sixth Half-Yearly Meeting of this Association was held at the Gas-Works, Southampton, on Tuesday, the 14th inst., under the presidency of Mr. S. W. DUKIN, the President.

[Before entering upon the business of the meeting, the members were conducted round the works by the President, and a very profitable hour was spent in their inspection.]

The HONORARY SECRETARY (Mr. T. W. R. White, of Sherborne) read the notice convening the meeting, and the minutes of the previous meeting, held at Taunton on the 9th of March, and they were confirmed. He then read the names of five new members for recommendation, Mr. R. K. Moorhouse, Andover; Mr. G. Stallard, Havant; Mr. S. Samuel, Totnes; Mr. M'Gregor, Ringwood; Mr. J. G. Livesay, Ventnor—and these gentlemen were unanimously elected.

The President said: Gentlemen, I have much pleasure in seeing you at these works, where I have spent 25 years of my life. I am also desired by the Chairman and Directors of the Southampton Gas Company to express their good wishes towards the Association, and to say they hope we shall have a successful meeting. It is not usual at our September meeting for the President to deliver an address, and, therefore, no apology is needed that I have not prepared one. Still there are certain matters to be discussed, of which I should like to call your attention. Our legislators, who hedge us about with Acts of Parliament, have just passed a Bill, entitled the Employers Liability Act, 1880 (43 & 44 Vict., chap. xlii.), which increases our responsibilities, in our position as employers of labour. The Act does not come into force until January 1st, 1881, and I recommended every gas manager to procure and study a copy of the Act. The electric light is making some little progress, but not, I think, in any way likely to affect the interests of gas companies. I notice that Messrs. Bass and Co., the well-known brewers, are about to introduce it at their works. We are going to make a trial. Sugar-street, in Southampton, has recently introduced a street-lamp regulator, for securing a constant consumption of gas. [A sample was handed round for the inspection of the members.] In ordering it the required consumption per hour must be stated, and it will be sent regulated to the quantity.

Mr. T. STONE (Weymouth) then read the following paper on

THE EXTENSION OF GAS SUPPLY TO THE MASSES.

I believe there is no matter connected with our profession which has been so much neglected by gas companies as that which forms the subject of my paper. In those where we will, we find that nothing pays so well as catering for the masses of the people, and we have the recognition of nothing that almost everywhere, where the people are the peculiarly cared for in commerce, it is by those who have to combat with keen competition, and who possess no monopoly such as we, or most of us, have.

Try to get your mind to the highly discreditability, as it seems to suggest that nothing is cared for but estates and nobles, and have the recognition of nothing that almost everywhere, where the people are the peculiarly cared for in commerce, it is by those who have to combat with keen competition, and who possess no monopoly such as we, or most of us, have. I fancy I hear some one say, "What! gas companies? I go out *toiling* for business! Not if I know it!" Well, I confess I see no objection to it, whether it be a matter of the improvement of the district, and as I had no opportunity of completing the matter before my next meeting of Directors, I broached the matter to them, but did not find sufficient encouragement to warrant my proceeding with the remaining half of the district; only the sense of having done what I believed my duty prevented my resting that I had put myself to so much pains, weariness, and labour which it involved.

I discovered in my perambulations that in about half, or perhaps something more than half of my district, there were 739 houses having no supply of gas; and assuming they all had a supply, I put a very low estimate upon them, viz.—

72	at £30 0 per ann.	4	at £15 per ann.
73	" 4 0 "	92	" 10 "
20	" 8 0 "	45	" 1 5 "
1	" 3 15 "	341	" 1 0 "
21	" 2 0 "	114	" 0 15 "
27	" 2 0 "	1	" 0 10 "

The gross amount was £1140 5s., and it cannot be supposed that once these houses obtained a supply of gas they would curtail their consumption to such narrow limits as those indicated; but I preferred to err on

the safe side. Had the whole district been so scheduled, I have no doubt I should have tabulated at least 1300 houses, estimated to produce a revenue of £2000 per annum. I do not for the moment suppose that, however strenuous the endeavours made to extend the supply in this direction, it would receive the favour of every household, but I do believe it would of a very large number—quite sufficient to warrant gas companies in making the attempt.

I propose, in the first place, to offer householders every facility to purchase gas-fittings at a very cheap rate—at prime cost if necessary—also gas cooking and heating stoves, and where they will not purchase them let them out on hire at a rental sufficient to cover interest on outlay and depreciation of price. This I would extend to every description of gas-fittings, and stoves for heating and cooking; but for gas-engines, I should probably be impracticable, in consequence of the great cost of those engines. I contemplated, had my Directors supported me, making an experiment with a terrace of 22 workmen's cottages above the average of gas-fittings at prime cost, for every purpose. That the masses of the people, three rooms—kitchen, sitting-room, and bed-room—and put in a small cooking stove capable of cooking an artisan's family dinner, at a prime cost of 40s., upon which I proposed to charge 10 per cent. interest; then the charge for meter hire, 4s. per annum; making altogether a fixed charge of 50s. per annum. There would be no outlay on the part of the householder, which I reckoned at 8 feet per hour for an average of three hours per night = 3285 feet per annum. For the stove I estimated 100 feet at 26 pence per 26 weeks = 2600 feet; together, 5900 feet, or roundly 6000 feet at 4s. 6d. per 1000 = £17 7s.; add 5s., the fixed charge, and we get a sum of 35s. per annum for the whole. I have no means of ascertaining whether it would be practicable to compare this with the probable cost of oil, spirit, or candles, which cannot surely be much less than the sum named; and it must be remembered that, by the use of the stove, the total fuel account is saved for 26 weeks in the year, which would alone, I imagine, amount to the gross saving of the householder for every purpose. That the masses of the people would hail any measures which would bring gas within their reach I do not doubt, for while spirit lamps have been brought to a high state of perfection, they are often the cause of much damage to property, and not seldom of loss of life, while at best they are very troublesome to trim and clean, and a great number of glass vessels are broken.

I presume none of us here would object to the great increase of revenue such an extension would bring us. What, then, are the objections to such an extension? The gravest that I have ever heard is that it would lead to a large increase of bad debts, and that the trouble of collection would be enormous. I grant all this to be true, but I think you are all aware that it would be great, but after, that is only a matter of cost—either an increase of salary to the collector, or the allowance of some assistance. Bad debts would probably be more than were averaged before, but I believe myself not to anything like an extent to warrant the quashing of the measure.

I thought some years ago of endeavouring to get a meter made which should be simply read, and be capable of registering the hundreds and tens, and having them read monthly for small houses, and the payment made in smaller amounts, to meet the fair objections raised that poor people will have to pay their money to pay the gas account, and you are all aware that it would be great, but after, that is only a matter of cost—either an increase of salary to the collector, or the allowance of some assistance. Bad debts would probably be more than were averaged before, but I believe myself not to anything like an extent to warrant the quashing of the measure.

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The President, in inviting discussion on the paper, said that gas was only used to a limited extent among the poorer classes in the South of England.

Mr. T. HARTLEY said that on a recent visit to the gas-works and offices of the Manchester Corporation, he was surprised to find that they had some

thousands of small accounts on their books, some of which were collected weekly, others monthly; and yet the amount written off as "bad debts" was very small. But Corporation, they could do as they pleased in the matter of payment, and it was the invariable rule to demand a substantial deposit, according to a fixed scale, or an approved guarantee. Accounts unpaid were handed over to a distinct class of collectors, whose sole duty it was to look after the arrears. Prompt payment was demanded, and supply cut off, at a week's notice, if the account was not paid. This was one way of dealing with a difficulty often met with even when deposits in advance were the rule. Consumers would, if allowed, sometimes get in arrears for a larger amount than they deposited in advance. The Manchester Corporation also charged a fee of 1s. for connecting or removing a meter, and the gas appeared to be very generally paid in advance. Another difficulty was that of frequent changes of tenants. He had often been obliged to go and prevent meters being disposed of by auction, and this was a serious objection to any scheme for letting out fittings on hire. A guarantee might be taken from the owners of the property to maintain the fittings in good order, but there would be a difficulty in obtaining it. The Association were, he thought, much indebted to Mr. Stone for his scheme of extension, as it was a question which had more or less occupied all present.

Mr. W. U. TRENBY said he found a difficulty in obtaining payments in advance. In Scotland most of the fittings belonged to the landlords, who included a charge for them in the house-rent.

Mr. HARDICK remarked that he had endeavoured to get a guarantee from owners of property for the fittings in the event of his Company providing them, but without success.

Mr. G. GAWRONSKY said that his experience in this matter was much the same as that of Mr. Hardick. He provided a form of guarantee to be filled up on behalf of every intending consumer, and failing this he insisted on a deposit. His rule was a guarantee, or a deposit, and he did not object to allow 5 per cent. interest on pre-payments. As soon as a meter was vacated, he sent for the meter and made the fittings good, in carrying out this rule was exercised, the consumer soon came round to it. He was pleased to hear what Mr. Stone had said, and the President had remarked that the working classes in the South of England rarely used gas. This was because they did not possess so much intelligence, or precise to make use of the property, as a very large proportion of the working class of England. In the large towns of Scotland, the "flats" inhabited by labouring people were all well lighted by means of gas; and in Manchester the workpeople's homes were to be found with plenty of gas, warm baths, and other conveniences. Those people had been educated up to it. Mr. Stone's scheme for letting out the fittings on hire was a very good one for the country, and beyond doubt there was a very wide opening for it.

Mr. H. STANBURY said that in his experience much depended upon the kind of working classes dealt with. He had some streets of small consumers who paid better than tradesmen; while some people were continually changing, and, as Mr. Grawonsky said, the poorer classes.

Mr. CROWE thought that the cheapness of oil, also the low price of oil lamps as compared with the cost of gas-fittings, had much to do with the limited use of gas by the poorer classes. He knew of instances where the tenants of respectable houses preferred to burn oil rather than incur the expense of gas, and he was not sure that it was worth while to carry a service into every house before the building was completed.

Mr. M'GAWSON remarked that this was always done in Scotland, and it was a general custom in that country for the gas companies to demand a deposit. If they thought such a course advisable.

Mr. J. W. B. WARR thought that the great difficulty was the fittings difficulty. Oil lamps could, he said, be obtained for 1s. or 2s. each, while the gas-fittings, even for a very small house, would run to 80s. or £2. Many people preferred doing without gas to incurring the expense of fittings. He had once passed a house where scarcely any gas was used, and found several cases where people would be hard to use gas, but did not feel inclined to go to the expense of fittings. He proposed to his Directors a scheme for letting fittings on hire, but they would not agree to it.

Mr. CROWE said, with regard to bad debts, the poorer classes in his district generally paid their bills promptly, and he had no difficulty in getting the money. His losses were oftenest suffered by those who had the means and ought to have paid. A short time previously he laid on gas to a village inhabited by poor people, and his Directors were opposed to this being done, on the ground that the bad debts would be large; but he had lost a great deal of money in the district. Mr. Stone's paper would be very useful, for though it was almost impossible to cut down the gas bills, he proposed, there were many very good hints. The remark that gas companies supplied gas only when it was asked for was, he thought, very pertinent.

The President said that the expense of pipes and fittings appeared to be the principal obstacle to the extended use of gas among the poorer classes. His own rule was not to lay a main in a new district until pipes were put into the houses, and he generally took a deposit, because there were so many changes of tenancy in his district. A reduction in the price of gas tended to induce an increased consumption.

Mr. H. COCKEY remarked that the Bristol United Gaslight Company usually demanded a deposit.

Mr. N. H. HUMPHRIES (Westbury) read the following paper:—

A FEW REMARKS ON LIME FOR PURIFYING GAS.

Our attention has lately been drawn to the subject of lime as used for purifying gas. Mr. William Foster spoke on the chemistry of spent lime, at the recent meeting of the British Association of Gas Managers, and within the few weeks since, Mr. W. H. Hislop has given an account of the Hislop's process for revivifying lime, at the meeting of the Southern District Association of Gas Engineers and Managers. I have therefore thought that a few remarks on the subject of lime would be of interest.

Commencing with the mineral substances from which lime is obtained, in passing we may notice that about 600 varieties of limestone are known, and they vary greatly in physical properties. There is the beautiful Bolsover magnesian limestone, of which the walls of our present Houses of Parliament are built; and there is the marly mud used for building walls, and some of the cottages, by the peasants of Salisbury Plain. The pure limestone is applied to the purification of gas, and when about 50 per cent. of lime, which, almost without exception, exists in the form of carbonate of lime. If we submit carbonate of lime to a bright red heat, the carbonic acid and lime part company, the carbonic acid passing away in the form of gas. When limestone is submitted to a red heat in a kiln, the carbonic acid is driven off, and the pure lime, together with the earthy impurities, which are but little affected by the heat, remains behind. The lime burners speak of "poor" or "rich" limestone, according to the percentage of lime contained in it. A poor limestone contains 60 or 70 per cent.; a rich limestone 80, or, more, per cent. of carbonate of lime. Carbonate of lime contains 56 per cent. of lime, and a limestone containing 75 parts of carbonate of lime is submitted to the action of the kiln, 33 parts of carbonic acid go off as gas, leaving behind 42 parts of lime and the 25 parts of earthy impurities. Hence the limestone loses weight in the kiln, and 100 parts of limestone yield from 60 to 75 parts of lime.

The lime is heated, or, to use the common term, "burnt," until it "takes" readily when water is thrown upon it, so as to be suitable for builders purposes. The time occupied in slaking, and the increase which takes place in its bulk during the operation, afford some indication of its quality. If more than 80 per cent. or so of pure lime be present, it slakes rapidly, and increases to more than double its original bulk. The less lime it contains the slower it slakes, and the less it increases in bulk. It is easy to test how much water a sample of commercial lime will take up in the operation of slaking, and we can thus obtain an indication of the amount of pure lime therein contained. The first thing is to ascertain whether the sample is completely burnt—that is to say, whether the residue of the carbonic acid is sufficiently small to be of any use as a purifying limestone. This is done before the lime is considered to be fit for use by the builders; but a rich lime, while sufficiently burnt to satisfy the requirements of these constructive artists, may contain as much as 5, 7, or even 10 per cent. of carbonate of lime. This matter is important to us, since carbonate of lime is utterly inert as a purifying material, and I dare say that each will have been specially for the use of large gas-works, this point has received attention; but it appears that the larger portion of the lime purchased for gas purifying is prepared in the ordinary way, as for building purposes. There are two ways in which we can satisfy ourselves as to the amount of lime in a sample. One is by raising a sample, drawn from the kiln, to a strong red heat for an hour or two, and observing if any loss of weight takes place; the other is to stir a few grains in a little water, and add a few drops of strong acid, when any carbonic acid contained in the sample will be displaced, and produce effervescence. The effervescence will be more rapid in a sample of pure lime, while to arrange with the lime burner that the time for purifying shall have a little longer sojourn in the kiln.

I have brought with me a sample of lime which bears a very good character both for building and gas-purifying purposes, which will produce a very good result when used for the latter purpose. It is a slight effervescence. Another sample containing 5 per cent. of carbonate effervesced strongly. I next proceed to show that lime should be delivered at the works as soon as possible after it is drawn from the kiln, and used in the purifiers as soon as possible after it is delivered at the works. The lime so treated will be found to be of a considerable length of time, it increases in weight by absorbing moisture and carbonic acid. A few minutes since I poured some solution of lime into this beaker, and you see it has already become cloudy, in consequence of absorbing carbonic acid from the air; if left for a few days the whole of the lime contained in the solution would be changed into carbonate. This illustrates the process which takes place, though in a much less degree, when dry lime is exposed to moisture and air. The moisture does no positive harm, but it makes weight, and it is not worth while to buy moisture at the price of lime; but carbonic acid kills the lime as far as purifying is concerned; every pound of lime which is rendered impure by carbonic acid is lost.

Having tested the lime for carbonic acid, it can be tested with water, to see how much it will take up in slaking. From the portion which has been heated, take a convenient quantity, say, 50 grains, add about an equal weight of distilled water; after allowing it to stand for some time, dry it by pressing the lime between two pieces of blotting paper, and weigh it. If for an hour or two, then weigh; 50 grains of pure lime will take up and chemically combine with 16·075 grains of water, and with these data, and the increase of weight in a given quantity, the percentage of pure lime can be calculated. I place on the table for your inspection a little apparatus used by myself for the purpose of drying lime, or any other material. [Apparatus explained.]

A good sample of lime should (1) not lose weight when raised to a red heat, or effervesce strongly with acids; (2) it should absorb a reasonable quantity of water in the act of slaking; (3) it should slake briskly, and increase in weight in bulk when so done.

Now let us just for a moment, before proceeding further, glance at the substances which for our present purpose may be termed the impurities of lime. The most common of these are earthy, sandy, ferruginous, or magnesian matters. Argillaceous substances are objectionable, as they contain a considerable amount of water, and the water, in passing some of the constituents of the clay to enter into chemical combination with the lime, thus reducing the percentage of free lime in the product, just as carbonic acid absorbed from the atmosphere would do. And lime containing such matters is also liable to set in the purifiers, increasing the lime required for its removal therefrom. The presence of magnesia increases the liability to over-burning. A moderate proportion of quartzose has no detrimental effect; the same may be said of iron ore.

We now proceed in connection with the use of lime for purifying gas, to consider the four processes which Mr. Foster has shown us. Mr. Harris can make lime do two services in the purifier, instead of only one, as usually obtained. Mr. Hislop proposes to go farther still, and restore the lime to its original condition any number of times, thus making it "beneficial for ever" to the gas manager's eyes. Mr. Foster, while remarking on the chemistry of spent lime, on the occasion referred to above, brought out one very interesting and important fact. I refer to the presence of free sulphur in the used lime, which warrants us in concluding that lime, to a small extent, undergoes an analogous oxidizing process to that we obtain with oxide of iron. I need not remind you that lime is similar in respect to this to iron, and that iron compounds of metal and oxygen. Oxide consists of iron and oxygen; lime, of calcium and oxygen. Calcium and oxygen are such close friends that it is very difficult to separate them. The process of obtaining the pure calcium is so complicated that a sample of lime is so common, calcium is so common, and 30 times more expensive than iron. I place on the table a small fragment of this interesting metal; if exposed to the atmosphere it would instantly become lime.

I have observed that if the hand be held over the stream of gas issuing from the open test-cock, the purifier being put into use, it feels cool, as the contents of the purifier gradually become charged with impurities, the stream of gas feels warmer, and when it feels decidedly warm to the hand the purifier requires to be turned off, as the gas will stain the test paper. This shows that the lime in the purifier gradually increases in temperature, and that the lime is so hot that it is not fit for use until it has cooled of the lime. I am at present giving this subject further attention.

The process patented by Mr. Hislop consists of restoring the lime, in a chemical sense, to its original condition as limestone, by displacing any sulphur compounds in it by a current of carbonic acid gas contained in the "brass" space. The whole of the lime is thus converted into the form of carbonate, the same as it existed in the original limestone. It is then reburnt, or raised to a bright red heat, just as in the kiln, and quick lime is obtained. The value of this process at any particular works is very easily ascertained. From the cost of the quicklime and the cost of the gas used for the process, and the amount of gas thus obtained. In my own case, at Westbury, this is about 10s. per ton. We are told that Mr. Hislop's process will restore lime for about 6s. 3d. per ton complete. But the lime must be burnt as soon as possible after leaving the purifier; for if spent lime be exposed to the atmosphere for any length of time, the sulphur becomes fixed, so that it is not displaced by

carbonic acid or by a red heat. It appears to me, therefore, that this process can only be adopted where the quantity of water required for purifying is sufficiently large to keep the apparatus constantly in use.

The subject of avoiding nuisance in the process of removing spent lime is interesting; but I have already occupied a considerable portion of your time.

Discussion.

Mr. G. GARNETT said it was all very well to be reminded of first principles—about carbonic acid, and so forth. He found the great difficulty in regard to lime was to induce people to use it wet enough and thick enough. There was no practical difficulty in using the lime in layers of 12 or even 18 inches thick; the old plan was to moisten the lime only sufficiently to make it cohere when squeezed in the hand, and to use it in thin layers. He found that by making the lime much wetter, and using it in thin layers, it would do 20 to 30 per cent. more work. The thicker layers did not increase the back pressure; at present he was using 3½ feet thickness of lime in two layers, and the difference of pressure between the inlet and outlet of the purifiers was 9-10ths. When he worked with four layers in each purifier there was a greater pressure, and he did not get so much work out of the lime. He supposed that when the lime was made moister than was the usual rule it assumed a more porous condition, and a more intimate molecular contact took place between the lime and the gas. The point he advocated was, thicker layers and the lime as moist as possible, so long as it did not become pasty. He had allowed a purifier to be used with the difference of time between the two being as small as it first on the series to remove sulphur, and up to the last it did not give undue pressure. He had also lifted the lid of a purifier and sprinkled the lime with water by means of a watering-pot, and the lime was improved, and seemed to receive new energy. When set to work again it removed a larger proportion of sulphur or carbonic acid than before being watered. He proved this with Mr. Harcourt's colour test. He might also remark that on one occasion, being troubled with naphthalene, he raised the lid of a 12-feet purifier, and sprinkled the upper layer with benzoline, and this proved an effectual remedy.

Mr. STONE said that the time he used to prepare the lime for purifying in the ordinary way, but had recently used it much wetter. He thoroughly mixed it until it was as nearly as possible like mortar, yet not mortar. He thus obtained better results, and the back pressure at the inlet of the purifiers, which, of course, included that of the meter and holder, was only 4½ inches.

Mr. CROWE: Does not the additional moisture with the lime tend to harden it, and increase the back pressure?

Mr. STONE: I have not found it do so.

Mr. T. W. R. WHITE thought that the increased thickness of the layers would increase the back pressure, especially if, as was often the case, any layer happened to get into the gas. The President said he used two layers of lime, each 4 inches thick, and two layers of oxide in each purifier, and he had four purifiers in action. He had found from experience that new and old oxide, if mixed together, produced a reaction which resulted in the evolution or giving off of some of the sulphur contained in the old oxide. He therefore placed the new oxide on the bottom layer of the purifier, and the old oxide on the top layer, the two layers of lime being between.

Mr. HUMPHRIES remarked that the experience of Mr. Garnett when he watered the lime seemed to support the opinion that the cooling of the lime was an important point in Mr. H.'s system.

Mr. GARNETT said everybody knew that the cooler the purifying material was the better it acted.

The President announced that the results of the voting papers for the election of office-bearers were as follows:—President, Mr. G. Garnett; Vice-President, Mr. Henry Cooke; Members of Committee, Mr. V. Upton, Tinney and Mr. C. Rafare; Honorary Secretary and Treasurer, Mr. T. W. R. White; Auditor, Mr. H. Sainsbury. These gentlemen were therefore unanimously elected, and briefly returned thanks.

It having been agreed to hold the next meeting of the Association at Berwick-on-Tweed on the 18th inst., the President and the Honorary Secretary and Treasurer, and the proceedings terminated.

The members afterwards dined together.

NORTH OF ENGLAND GAS MANAGERS ASSOCIATION.—A meeting (the seventh half-yearly) of the members of this Association will be held on Saturday, the 2nd prox., at Sunderland, under the presidency of Mr. J. H. Cox. A paper will be read by Mr. J. T. Jolliffe, on "The Utilization of the Waste Heat from the Retort Flues for the Generation of Steam;" and one by Mr. W. J. Warner, entitled "Notes on the Work of Purification." The Chairman and Directors of the Sunderland Gas Company have invited the members and associates to visit the Hendon Gas-Works, and afterwards lunch with them.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.—In reference to the discussion (published in last week's issue) on Mr. Veevers's paper read last night at this Institution, Mr. W. A. Walker, of the Eiland Gas-Works, in which he says that he intended making a few remarks, but had unfortunately left his note-book at home. He has at his works two scrubbers filled with boards; pumping ammoniacal liquor through one, and using clean water in the other. The quantity of coal used in 1879 was 1,879 tons, and the quantity of liquor obtained was 755 tons, or 39½ gallons per ton of coal carbonized. The cost of purification, including lime and labour, has been reduced from 0.71d. to 0.54d. per 1000 cubic feet since the introduction of the scrubbers. He has had a gallon of 8° Twad. liquor analyzed, and it was found to contain 1.947 per cent. of NH₃, 0.744 per cent. of SO₂, and 1.425 per cent. of CO₂. The scrubbers give no pressure and require no power, except the pumping of the liquor through the first scrubber. No trace of ammonia whatever is left in the gas.

WAVELEY ASSOCIATION OF GAS MANAGERS.—The half-yearly meeting of this Association was held at Berwick-on-Tweed on Wednesday, the 8th inst. The chair was occupied by Mr. Hall, Manager of the Berwick and Tweedmouth Gas-Works, and there was a good attendance. The members first visited the gas-works at Spittal, and congratulated Mr. Hall on the improvements he had made. When on their way to Berwick to hold their meeting, the members were kindly entertained by Mr. Alexander Robertson, of the Tired Iron Works, at his house. They then proceeded to the village of Arrol, where, the meeting being over, they were again entertained by a statement of the funds of the Association, showing that they were in a satisfactory condition. The Chairman, in his address, gave his opinion on the different appliances used in the manufacture of gas, and their merits were freely discussed. At the close of the business the members of the Association, joined by a few friends, dined together, and the rest of the day was passed in social intercourse and enjoyment. The meetings of the Association next year are fixed for the second Thursdays in April and September, at Melrose.

THE FORTHCOMING EXHIBITION OF GAS APPARATUS AT GLASGOW.

[From the Glasgow Herald.]

Under the auspices of the Philosophical Society of Glasgow, there is about to be held an exhibition such as has never previously been held in Scotland, and such, indeed, as has never been equalled in the United Kingdom. If we consider its extent and variety, and the degree of scientific interest attached to the collections of exhibits in several of the departments. Briefly it may be called a Gas Apparatus Exhibition, but it is to be that and a good deal more.

Starting with a guarantee-fund of upwards of £1100, the accumulated result of the proceeds of a Fine Art and Industrial Exhibition held by the same Society in the winter of 1846-47, the promoters of this exhibition resolved to do something towards advancing several departments of applied science, by giving inventors, manufacturers, and other persons an opportunity of showing what could be done in improving the materials and methods of artificial lighting and heating, and the apparatus connected with the same, recourse being had to coal gas, electricity, mineral oils, and the gases obtained from them, candles, &c. They also thought that the conduction of sound by electricity, the use of gas and water for producing motive power under a variety of circumstances, the apparatus connected with the safe working and selection of mines whose atmosphere is more or less charged with inflammable or explosive gases, and various other allied subjects, should fall within the scope of the exhibition. Very early in the progress of the movement a large and influential Executive Committee was constituted, and during the past three months an extraordinary amount of work has been overtaken by them; and the result is that there will probably be well-nigh, if not even quite, 150 different firms, companies, and individuals entering and accepted as exhibitors. The exhibition, which is to be held in the Burnbank Drill Hall and grounds, Great Western Road, is to be opened on Tuesday, the 26th inst., and is to be continued for a period of four weeks. Let us now glance at some of the prospects of the undertaking have assumed a very definite shape, and are such as to warrant us in noticing some of the more interesting matters connected therewith. There will be given in connection with the exhibition no fewer than five evening lectures by men eminent in their respective departments of the science of the exhibition, and the subjects are "Household," another, "Heating by Gas." One of the lecturers will discourse on "Lighthouse Illumination," and there will be lectures on "The Coal Tar Colours," and on "Conduction of Sound by Electricity." At least two of the lecturers are the leading authorities in Britain on the subjects on which they will treat.

Visitors to the Burnbank Drill Hall will find laid out for their inspection and study a large and varied display of apparatus to illustrate the manufacture, distribution, measurement, and use of coal gas—beginning with the retorts, and ending with the burners. In every case there will be objects of the most practical and scientific interest, and the exhibition, especially in respect of meters, wet and dry, from eminent makers in Edinburgh, Glasgow, and London; burners, including Suggs', Bray's, and some most wonderful things from Dublin, the invention of Mr. Wigham, and likely to be of great advantage for lighthouse illumination; and in respect of the use of water, of which at least one of the most interesting will be shown in action doing useful work. It is also just possible that a Glasgow inventor—a clever mechanic and chemist—may also be able to show what this city can do in the same direction. One of the types just referred to is, we believe, quite a new invention, combining several improvements that have suggested themselves during the last few years. In the department of heating and cooking by gas there will be a large and interesting display from the leading makers, as well as from recent inventors, and not the least important thing amongst the stoves will be that of Dr. Adams, of this city, which will on this occasion be publicly shown for the first time. The invention is not to be regarded as one of the most novel exhibits, as it is certainly one which has excited a large amount of interest amongst gas managers, gas-stove manufacturers, inventors, and scientific men, and other persons throughout the kingdom, the general belief being that it is practically and scientifically the most important advance in the connection with the application of gas to heating and cooking by gas. We understand that Dr. Adams intends to have ready for exhibition no fewer than three forms of his stoves, one of which will illustrate the application of his invention to cooking purposes. The secondary products of the coal gas manufacture will occupy a leading place in the exhibition, more especially those of chemical value, as pointed out by chemists during recent years. There will be a large collection from the works of the West of Scotland Chemical Company (Messrs. Archibald Arrol and Sons), Dawsholm, Maryhill; and in the department of coal-tar dyes, two splendid collections are to be sent from London, through the special efforts of Messrs. Henderson, Hogg, and Co. of this city—the exhibitors being Messrs. Burt, Boulton, and Haywood, and Messrs. Brooke, Simpson, and Spiller, both of them firms of the greatest eminence in this field of scientific industry. Other two important and extensive collections of those dye-stuffs—embracing both the aniline and the coal-tar series—also coming from Germany, the intermediary in this instance being Mr. J. A. Dixon, who, besides being legal adviser of the firm in this country, is quite at home in the literature and science of such chemical products. In the collection from one of these establishments there will be one of the latest and most important of the coal-tar dyes, the synthetic product of the "Prima" dye. But both collections are of such interest that they will doubtless command a great degree of attention both from scientific chemists and from practical dyers, calico printers, &c.

Electric lighting will be a prominent feature of the exhibition, applications for space having been made for several firms, whose designs of modern electric machines and lamps may not unlikely be submitted to a series of competitive tests of an exhaustive character by a committee of jurors, who may be regarded as experts in such matters. The leading exhibitor in this section will be Mr. R. E. Crompton, of London, whose scientific skill has already been well demonstrated in the lamp of his invention which is in operation at St. Enoch Station, certainly one of the best electric lamps yet brought into use. It is whispered, however, that before the exhibition closes there will be brought forward a lamp that is calculated to outstrip everything of the kind that has before the public. It is the invention of Mr. J. H. Gordon, the Assistant Secretary of the British Association, and is spoken of by leading authorities in matters electrical as a great scientific triumph. We may mention that it is proposed to put the electric light and gas light against each other in the Drill Hall. At the suggestion of Mr. J. L. Thompson, one of the most prominent and successful of those to whom in a great measure has been committed the duties of hall arrangements, ventilation, &c., it is proposed to have the exhibition constantly under artificial light, one day or span being given up to each of the two parties of exhibitors, those dealing in gas light and those who pin their faith to the new light. It is intended also to have some of the "great lights," both gas and electric, shown in the grounds in front of the Drill Hall. Messrs. Thornton, to whom the refreshment department has been entrusted, will extensively illustrate the use of such an exhibition by

cooking with gas. They may also give some practical demonstrations of a public or semi-public character.

In another department water-motors and water-motors will form an interesting series of exhibits, the latter being all shown in action. Some of the engines will be engaged in providing for the thorough ventilation of the Hall—namely, those which have given much anxiety to Mr. Bruce and his fellow-members of Committee.

Amongst the miscellaneous apparatus there will be shown a gas-lighted buoy (Frutich's) such as is now used at Rosneath, Patch, and as is henceforth to be used at the Admiralty Dock and Garvel Point. The buoy will be charged with gas to maintain it in action consistently during the whole of the four weeks that the exhibition is to be open. There will be some interesting and valuable apparatus connected with lighthouse illumination, more especially that sent by Messrs. Chance Bros. and Co., Birmingham; and also, likewise, be an extensive collection of safety lamps—such as "Gordale" of 1846, and a "Davy" of 1860—along with fire-damp indicators, ancient lamps from Jerusalem, &c., and the exhibition will doubtless be somewhat memorable from the way in which the gas goals of Scotland are to be illustrated.

Altogether the exhibition promises to be exceedingly important, interesting, and deserving of success.

ON A SYSTEM OF HOT CONDENSATION.

By Mons. F. CADEL.

A Paper read at the Meeting of the Société Technique de l'Industrie du Gaz en France, held in Paris, June 22 to 24, 1880.

Translated from the *Journal des Usines à Gaz*.

Gentlemen,—Your attention has for some time past been very properly called to a system of condensation having for its object to increase the illuminating power of gas, by keeping in it the light hydrocarbons which are usually absorbed by the tar. The principles of the system were set forth two years ago in a paper read before a meeting of gas managers in Scotland, and published in the *Journal des Usines à Gaz* (See Vol. XXX, p. 302). I was the more struck with the system, because, without being aware of the fact, I had in part brought its principles into practical application; and besides this, in view of the possible competition of the electric light, with which we are occasionally threatened, it appeared to me that a process so simple and so economical for increasing the illuminating power of gas would be one of the best weapons of defence for our industry, and therefore I resolved without any delay to make it as complete as possible.

I will begin by defining its theory, which, it seems to me, has not as yet been sufficiently elucidated. It rests entirely upon the fact, that when the tar is brought into contact with the gas, it absorbs the light hydrocarbons which the gas contains, and, as a result, very materially affects its illuminating power, but that this pernicious influence diminishes when the heat increases, and disappears altogether when the temperature of the hydrocarbons reaches their boiling point.

It was therefore, led to the following conclusions:

1. It is necessary as far as possible to avoid the contact of the gas and the condensed tar, so that the one may not be subjected to the injurious action of the other. Experience has proved to me that this is the essential part of the method, and the principle that should serve as a rule for condensation, especially at the commencement.
2. Where contact of the gas with the tar cannot be avoided, as upon the interior surfaces of the pipes, it should take place at the highest possible temperature; at least it certainly ought not to take place at a low one, and therefore the pipes should be protected from the exterior atmospheric influences.

Lastly, the largest possible portion of the tar should be condensed in a heated state—that is to say, while its contact with the gas is the least injurious; and it is clear that, as a result, the gas will have so much the less to fear from the tar, inasmuch as it will carry forward with it a smaller quantity.

To effect this, the gas must be kept for a certain length of time at a high temperature in appliances sheltered from the action of the exterior temperature, or even, if possible, artificially heated. In order, however, to discover the method, and the principle that should guide me, I have hitherto been attached, I would call your attention to the fact that where the object is not to keep the gas and the tar together, seeing that, as regards illuminating power, one has nothing to gain by being with the other, whatever may be the temperature, and this I hope to demonstrate presently by some comparative experiments. The object is simply to obtain at a high temperature the separation of the heavy tars, which, as we shall presently see, are most injurious to the illuminating power of the gas. When there remains only the light tar in the gas, we shall no longer have to take so many precautions.

In applying the foregoing principles, I first of all endeavored to prevent the contact of the gas and the tar in the hydraulic main. I was at that time using pipes of 57 centimetres (22 inches) in diameter, one to every three ovens, and from these pipes the liquid flowed away by the upper level. For these pipes I substituted others of 90 centimetres (35 inches) in diameter, with the view, if possible, of effecting a diminution of the seal; and to bring about the separation of the gas and the tar, I caused the condensed products to flow away by the compartment opposed to the gas. As there was no condensation of water in the hydraulics, but, on the contrary, that with which they had been filled at the outset gradually evaporated, I caused more to be added at regular intervals.

Under these conditions, I noticed during the past winter considerable differences in the illuminating power of the gas when it bubbles through tar water. The former was on an average of 39 to 40 litres (3·4 to 3·6 cubic feet) with difficulty obtained in the latter, I made gas of 86 litres (2·97 cubic feet) on the average, and one day we came down as low as 80 litres (2·8 cubic feet). This experience has been repeated on several occasions in the most conclusive manner. It must be stated, however, that we were then the more struck by the very small water, and a separate hydraulic main for each bench. The result was, owing to the large exterior surface, there was a considerable cooling of the liquid, the temperature of which fell below 6° C. towards the end of the distillation. The same kind of experiments made in warmer weather gave much less marked differences in the same conditions.

It is certain that the benefit resulting from the separation of the gas and the tar in the hydraulic main will vary considerably according to any circumstances which may cause a variation of the temperature of the tar in the main, and also perhaps with the method adopted of conducting away the liquid; for if this is effected at the lower part of the main, a large tar, in which the gas bubbles is constantly being removed, while if the liquid flows away at the upper part the gas always bubbles in approximately the same tar, which, by becoming saturated with hydrocarbons, should not have any effect on the illuminating power of the gas. The temperature of the liquid in the hydraulic main will, as a general rule, exceed 80° C. if the main is of small diameter, and has to serve for several benches, when the latter are suitably heated and are working in the proper manner; but if one portion of the settings in connection with a hydraulic is out

of action, or if the retorts are badly heated, great risk is run of the tar being of a sufficiently low temperature to materially affect the quality of the gas, so much the more so in proportion as the outside temperature is lower and the hydraulic farther removed from them. This attention to the quality of the gas will offset any small and difficult appreciation, inasmuch as different circumstances may cause a variation in the illuminating power; it will nevertheless be quite perceptible in most cases, even when the temperature approaches 50° C. This will be apparent from the following experiment:—Having placed some hot water in a barrel, I found at a temperature of 77° C. a loss of about one-third of the illuminating power when the gas was compared with a similar size of burner receiving its supply from a wet meter. The loss was 44 per cent. at 70°, 56 per cent. at 60°, 65 per cent. at 44°, 75 per cent. at 35°, and 87 per cent. at 18° C. It will thus be seen how energetic is the action of the temperature upon the gas, and how rapidly it increases when the temperature falls.

As a consequence of what has been stated above, I have no hesitation in thinking that it is desirable to adopt generally the system of causing the gas to bubble in water, in order to definitively protect it from the action of the very variable causes, and one which may become serious, of alteration in the illuminating power of the gas. The employment of water appears to me to be absolutely necessary if it is desired to use a large-sized hydraulic main, and especially where one main is used for each bench; although, instead of adding fresh water from time to time, it would evidently be better to introduce a small stream of water, which is the plan I am about to adopt, and I hope by so doing to facilitate the flow of the tars that are viscous, and flow with difficulty even through pipes of 30 centimetres (8 inches) diameter. If the gas cannot be allowed to bubble in water, it is evident that hydraulic mains of smaller size, and in which a considerable quantity of liquid, which should flow off at the upper part—should be used; and also those well protected from the effect of cooling from without, and which are not connected with more vents than those which are generally in use at one time. All these arrangements have for their object the same end, namely, to keep the gas as long as possible, and the reduction to the minimum of its contact with the gas.

[The author of the paper then gave a somewhat lengthy description of a special form of hydraulic main, which he, considered to possess advantages over that generally employed.]

Some time since I placed in each of our three settings of 12 retorts, (32 inches) in diameter, which I called the artificial hydraulic, and which received the gas from either side of three transverse pipes, 30 centimetres (12 inches) in diameter. Between these pipes and the hydraulic, I had a horizontal pipe of about 500 feet of piping, 60 and then 50 centimetres (24 and 20 inches) in diameter, upon the length of which there were placed some coolers with running water, and the exhausters. These coolers were formed by two vertical plates of metal separating alternate layers of water and gas. By thus having the gas pass through the water, I hoped to effect a better state of the production of the different ovens, I hoped to effect an improvement, without being altogether clear as to how it was to be brought about, and I tried to effect a diminution in the deposits of naphthalene rather than to obtain an increase in the illuminating power of the gas. I fancy I obtained an increased yield, although I am unable to say to what extent, but the result likewise appeared to be equally successful as far as the naphthalene was concerned, as the deposits of this substance became more and more rare, and occurred at points still farther removed from the works. But more especially I obtained a considerable improvement in the quality of the gas.

In the month of August, 1877, with 12 retorts producing altogether 14,000 cubic metres (500 cubic feet) of gas per 24 hours, we had an average standard of 92·85 litres (3·25 cubic feet) at a barometric pressure of 760 millimetres (29·5 inches), and with the temperature at the entrance of the gas at 75° C., and the temperature of the water in the coolers stood at between 30° C. and 40° C., and brought down the gas to only 55° C.; on its entrance into the pipe condenser it was at 40° C., and on its exit therefrom it was at from 20° C. to 25° C., which was very nearly the outside temperature. Thus the principles of the system were clearly demonstrated.

In the following months, using the same coal and raw material generally, the illuminating power decreased. In September it was 90 litres (3·15 cubic feet); in October, 94 litres (3·3 cubic feet); in November, 92·50 litres (3·23 cubic feet); in December, 91·50 litres (3·2 cubic feet); and in January, 92·80 litres (3·25 cubic feet). Having since then employed kinds of various qualities, the standards have ceased to be comparable. There cannot be any doubt that the differences I have just mentioned were due to the effect of the outer temperature.

In order to complete the application of the new principles to our condensation, and also to protect the gas from atmospheric influences, I decided at the beginning of the year 1878 to increase to 1·75 metres (5 ft. 9 in.) the diameter of one of the artificial hydraulic mains, and I protected each from the action of cold by means of a casing, which I also applied to the pipes conducting the gas into it. It was at this period that I decided to try the effect of the new system on the old hydraulic, and I fixed them after the new 5 ft. 9 in. hydraulic along the walls and in the interior of the retort-house. Finally, in order to separate as soon as possible the gas and the condensed tar, I arranged to have them conducted away by means of special piping, branching off at several points from the gas pipes.

Under conditions such as these, and with the same kind of coal, we obtained during the past winter, with a temperature ranging from 12° C. to 17° C., an average standard of 85·30 litres (3·03 cubic feet) with 24 ovens, one-half of the outside temperature always. The result was, with the aid of the new system, a much smaller one. There was no improvement of more than 0·2 of a cubic foot of gas over the quantity obtained in December, 1877, but it was the same standard as we had in August, 1878.

In the succeeding months we were compelled to let down the retorts considerably, and the temperature of the gas was reduced to a minimum in the illuminating power of the gas, as was the case in the autumn of 1877, but to a much less degree. Thus in April the average was 87·50 litres (3·03 cubic feet) instead of 94 litres (3·23 cubic feet) obtained in October, 1877. Quite recently, with 12 retorts on the small hydraulics, as in August, 1877, but with the same outside temperature, we again reached the standard of 85·30 litres. All these figures are taken from the official testings of the gas, which are made every evening.

Therefore, although my new arrangements worked very incompletely, they regulated the illuminating power of the gas very well; but the action of the outside temperature always shows itself, and we notice that the standard is decidedly better in summer and in winter than in the intermediate seasons. These variations are explicable only by the influence of the tar deposited on the inner surfaces of the pipes. The temperature of

this tar is affected by atmospheric influences through the thin sides of the pipes, and its action upon the gas varies with its temperature. In summer this action is diminished by the elevation of the outer temperature; and in winter it has an effect relatively much less, consequent upon the large quantity of gas passing through the pipes.

I found that the standard of the gas varied very perceptibly, not with the temperature of the gas itself in the pipes, but with the outer temperature, with the atmospheric influences of wind, rain, or sun; that is to say, with the temperature of the sides of the pipes, and, consequently, with the tar deposited thereon.

Thus, having one day made some gas of 85 or 86 litres standard (3 or 3·2 cubic feet), at a temperature of 18° C. to 20° C., and in calm weather, it happened that on the following morning we obtained a standard of only 90 or 92 litres (3·16 to 3·23 cubic feet) with an outside temperature of 10° C. to 12° C. Here the action of the tar deposited against the sides of the larger artificial hydraulic main, and over three-fourths of its length, it had remained about the same. I increased it by means of a jet of steam in the artificial hydraulic, but without improving the standard. These observations were made at several successive intervals. It was also noticed very frequently that the standard went up suddenly upon an unexpected increase of temperature taking place. This is at once the consequence and the proof of the influence of the condensed tars, which, becoming, by means of the cold, enriched with illuminating hydrocarbons, probably restore them to the gas under the influence of heat. The following are some further observations. In the report of the day, having caused the gas to pass from the small hydraulic into the larger one connected with the furnaces not in use, I found on the first day a very notable diminution in the standard of the gas, which fell to 93·50 litres (3·27 cubic feet), notwithstanding that I had two jets of steam which kept the gas at a temperature of 30° C. Here the action of the tar deposited against the sides of the larger artificial hydraulic is clearly seen. These sides took a long time to become hot, in consequence of the thickness of their coating, notwithstanding the high temperature of the gas. The condensed tars first of all cooled very considerably, and this seriously deteriorated the standard of the gas. Here the action of the tar deposited against the sides became hot, and, in fact, the standard the next day was 2 litres (0·07 cubic foot) better, and it improved still further the days following. On the other hand, we obtained an important increase of illuminating power simply by covering up a length of 40 metres (46 yards) of pipe placed between the two mains.

Lastly, in causing the gas to pass from the outlet of the artificial hydraulic, at one time into a water cooler having a superficial area of 120 metres (130 yards), at another into a pipe condenser, we have noticed in the latter case a diminution of illuminating power of about 1½ litres (0·05 cubic feet), which could not be the result of anything else than the tar deposited next the cooling surface, which was so much more extensive in the pipe condenser.

In the course of these experiments I have been able to convince myself of another very interesting fact—namely, that the heavy tars (those which are first deposited, and do not contain any benzol), are by far the most injurious to the gas. Hence the action of the tar deposited against the sides, on the one hand, the tar has the least injurious effect upon the gas the lighter it is, the more it is charged with light essences, and the longer it remains undeposited.

Thus I did not find any very appreciable difference in the illuminating power of the gas by not using, or by using a cold standard, a pipe condenser of 700 metres (765 yards) extent, placed after the exhaustor, and receiving gas cooled down to 35° C. or 40° C.; and you have had an example of the pernicious action exercised by tar upon apparatus containing hot gas.

For the rest, it is easy to see the differences in the action of the heavy and the light tars, by putting into a meter some gases of different densities, and comparing the gas from a bat's-wing burner supplied by this meter with that from a similar burner, of the same consumption, supplied by a wet meter. Thus, while at the temperature of 18° C. the heavy oil takes away 57 per cent. of the illuminating power, I have noticed that the tar collected in the pipe condenser of the gas works tar condenser destroys only one-fourth of it, and that coming from the condenser only one-tenth. If the meter is caused to work for a certain time with heavy oil, it is observed that the liquid increases day by day, thus clearly proving that the illuminating power is essentially dependent upon certain light essences, and that the standard of the gas is not lowered so much, and a little by little in proportion as the oil becomes charged with hydrocarbons. This leads me to ask, in passing, if it does not seem possible to employ in gas-meters a mixture of heavy oil and benzol, in the condition when it is without influence upon the illuminating power of the gas. This mixture, however, has some disadvantages, and the standard of the gas would moreover would not have any injurious effect upon the meters. The employment of such a liquid, if it became practicable, would be one of the most important steps in the progress of our industry.

I was desirous of finding out the influence upon the volume of the gas of the apparatus for condensing by heat, by causing the gas to pass from different sides. I ascertained that this influence was favourable, though I could not arrive at very definite results.

We have already seen that the gas, in passing into a pipe condenser on leaving the artificial hydraulic was not of so good a quality as when it passed directly from the condenser of the gas works. The standard of the former were more considerable. The beneficial influence of the increased volume was nullified by that of the tar deposited upon the sides. When the gas was caused to pass for several days in succession into the two artificial hydraulics, the standard reached an average of 84 litres (3 cubic feet), and 85 litres (3 cubic feet) in the second. The standard of the gas going directly into the water condensers, although the volume was incomparably greater. Here, again, the influence of surface counterbalanced in a great measure that of volume. It is, however, as I remarked just now, an important improvement, and I believe that, if the larger artificial hydraulic were heated from the outside, this improvement would be much more considerable.

The theoretical statements I made at the commencement of my paper have, therefore, been entirely verified by experience, and we are in a position to draw from them with certainty the following practical conclusions—

As a general rule, it is requisite for hot gas condensing to have apparatus of large volume and of as restricted surface as possible; and it is especially essential that this surface should be enveloped in a covering which would thoroughly protect it from atmospheric influences. It would be still better, if it could be heated from without, as can be done with the artificial hydraulic on the entire block of ovens, by building it into the brickwork, so that it is not sufficient to simply place it thereupon. An artificial hydraulic of 2 metres (6 ft. 6 in.) in diameter appears to be of suitable dimensions for two retorts set side by side.

The shape of the apparatus, too, is a matter of much importance. The inner surfaces should be so arranged that the least possible quantity of tar should be liable to attach itself to them. The round shape appears to be a decidedly bad one, for the reason that the lower half alone receives the tarry deposits, which glide slowly to the bottom of the pipe, and are thus

brought into prolonged and repeated contact with the gas. A flat-bottomed pipe seems to be preferable, since the surface receiving the tar is reduced to a minimum. The best pipe for hot gas would, I believe, be one with a flat bottom, and having this bottom covered with a layer of water which would conceal the tar, and protect the gas from its action. And it is to be noted that a round pipe would be the more defective the smaller its diameter was.

A gasholder placed in a closed building, which could be heated if necessary, would be an excellent, if not perhaps the very best condenser for hot gas. The water, which could be renewed and cooled, would act as a refrigeratory, by intercepting itself between the gas and the retorts. Placed before the exhaustor, the gasholder would at the same time act as a regulator, and, in case of need, its reserve of gas could also be utilized.

Washers, of whatever kind, are good things, as the water used therein protects the gas from the action of the tar. And here I will mention a note related to me by one of our colleagues. The water made at a small works was, on one occasion, allowed to pass directly from the retorts into the holder, the result being a very considerable increase in illuminating power.

Vertical condensers, although having but little injurious effect upon gas that has been already cooled and deprived of its heavy tars, are evidently of no use for hot gas. A cluster of horizontal pipes of sheet iron would be of still less value. The horizontal position of the pipes is evidently the most unsuitable, as far as the contact of the gas with the tar is concerned. On the other hand, I have been able to convince myself that washers, of whatever kind, are good things, as the water used therein protects the gas from the action of the tar. And here I will mention a note related to me by one of our colleagues. The water made at a small works was, on one occasion, allowed to pass directly from the retorts into the holder, the result being a very considerable increase in illuminating power.

It is quite unnecessary to say that a coke column, without a water spray, would be of no use for hot gas. A cluster of horizontal pipes of sheet iron would be of still less value. The horizontal position of the pipes is evidently the most unsuitable, as far as the contact of the gas with the tar is concerned. On the other hand, I have been able to convince myself that washers, of whatever kind, are good things, as the water used therein protects the gas from the action of the tar. And here I will mention a note related to me by one of our colleagues. The water made at a small works was, on one occasion, allowed to pass directly from the retorts into the holder, the result being a very considerable increase in illuminating power.

It cooled far less so detrimental an influence upon the gas. It was only natural to suppose that a very great advantage would be gained by keeping the whole of the tar at a high temperature by means of a mechanical condenser, and this I endeavoured to do by setting up one of Pelouze and Andouin's apparatus at the outlet of the artificial hydraulic. The gas, passing through this apparatus, was separated into two parts, one of which was very richly with so large a quantity of tar to condense. A difference of 15 centimetres (6 inches) in pressure was required in order to pass 14,000 cubic metres (500,000 cubic feet) of gas in 24 hours through a condenser constructed to pass 30,000 (1 million cubic feet), but I was satisfied that it took out nearly the whole of the tar.

It would be advisable to repeat the same experiment at a higher temperature; and for this it would be necessary to superheat the artificial hydraulic, though I doubt whether any good results would be obtained. One might succeed in dissolving the heavier tars, but the gas would be so encrusted. The non-success of our attempt proves clearly that the gas does not derive any benefit from the tar, at least in a way that will be permanent.

I stated at the commencement of this paper that the system of condensation was one which I had occupied had for its object, like the prevention of the naphthaline deposits, and it is now clear that the more the hydrocarbons are kept in the gas, the greater will be its power to dissolve naphthaline, and consequently so much the less of this substance will be deposited in the mains. But there is something more than this, and the system I now introduce goes so far as to get rid of the naphthaline deposits. This system is of great interest, as it has not yet been quite absolutely proved; but after what has been experienced with naphthaline at the gas-works at St. Etienne, we may reasonably come to the foregoing conclusion.

Twenty years ago this was a matter that did not occupy much attention; but a few years later the temperature of the retorts having been increased and the consumption of gas considerably developed, without the plant having been very much enlarged, the condensation broke down. The bends in the washers and purifiers, and especially those in the gasholders, were choked with naphthaline, though at the same time there was no trace of it in the town mains. For some considerable time I was enlarging our cooling and purifying apparatus, without touching the neighbouring pipes from the ovens. Naphthaline disappeared from the works; but then it deposited itself in the town mains, at first in large, afterwards in smaller quantities, and then in gradually larger deposits, which were so great that they finally choked the gas holders, and the naphthaline condensed at the works. However, there was always some of this impurity present in sufficient quantity to cause annoyance and trouble. When I fitted up the 32-inch artificial hydraulics, with the 20-inch pipes following them, the naphthaline deposits diminished considerably, though they did not disappear. Since then, I have enlarged the plant, and the naphthaline has not been so great, but I do not hear anything of this. In the spring of the present year some traces of naphthaline were pointed out to me; but the larger hydraulic has not been in operation for the past few months.

It is somewhat difficult for me to argue the question theoretically, as I am unacquainted by experience with any facts in connection with the subject of the presence of naphthaline in the free state in gas. I tried to pass a small part of the gas produced in one of the retorts into a flask plunged in a refrigerating bath. Between the fourth and fifth hours I obtained some crystals. I applied the flask to the gas, and it was then absorbed by the tarry vapours which are present in considerable quantity; while in the latter hours, as the gas no longer contains any tar, the naphthaline vapours remain in it in a free state. It is clear, therefore, that in order to relieve ourselves of these vapours, we have only to put them in contact with a liquid which has been cooled. This is in fact what is done, the contact may be effected without detriment to the illuminating power of the gas, it must take place at a high temperature, which will facilitate the dissolution of the naphthaline. The simplest plan is evidently to mix in a hot state some of the gases from contiguous retorts, charging the latter at different hours; this is what takes place in the artificial

and recent mails from India, Australia, and the Cape have added respectable numbers to the number. Tube makers are, on the whole, well occupied, but the newly advanced lists have brought about a slight check. Galvanizers are those who are experiencing the greatest share of improvement in business; they are tolerably full of orders on export account, and are negotiating for substantial parcels of sheets. Mining meetings have been held during the week, and the coal and iron collieries are increasing prices, which they maintain are, as at present standing, ruinous to masters and men.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The finished iron trade throughout Yorkshire, although exhibiting not much activity, holds its position. There is also a fair output of pig iron from the furnaces in blast, which of late have undergone but few changes. Very little iron ore is now raised at the South Yorkshire pits, so that supplies are for the most part obtained from North Lincolnshire for the South and West Yorkshire furnaces. In the North Riding or Cleveland district the output is well maintained. Last year 4,750 tons were raised, which is valued at £712,000, as compared with 3,325,582 tons in 1869, which was then assessed at £281,359. It will be observed that although the output last year was greater, the value is less in proportion to what it was ten years ago. It is stated that great difficulties exist as to smelting the value, owing to much of the ore being consumed by furnaces in Cleveland, as well as from the fact that a large proportion is being supplied under contract made many years ago, and having many years to run. The present value is fixed by the ore being estimated at from 2s. 9d. to 3s. 3d. per ton net at the colliery, and the very few collieries or iron companies where colliery and builders' castings are chiefly made; but at several places where gas-pipes and apparatus are produced business continues very fair. Makers of Bessemer steel rails, tires, and axles have no cause to complain.

The steam coal trade maintains its position, and during the week the West Riding pits have sent a full average tonnage to Hull and Goole. From the collieries in the southern part of the coal-field the quantity despatched by water has been large, several of the leading pits having canal accommodation having large stacks on hand, which they can supply whenever the market is very active. The collieries in the northern part of the average one, whilst the port is within easy reach of the South Yorkshire district, from which the coalowners enjoy the same rate as they pay to Hull.

The contracts for gas and locomotive coal are being quickly executed, and those companies which secured them are working pretty well. A great change has this year come over some of the pits which for years have enjoyed part of these contracts, but declined to tender at the low rates at which it is said they were placed. There is nothing new to note with regard to manufacturing fuel, which is not over good to sell, although slack can be purchased for little more than the men have for getting and sending it out. The quantity of small coal which the colliers are producing is being taken notice of, and at one of Earl Fitzwilliam's pits where disputes exist a machine has been fixed to test the quantity.

The position of the labour market is a very unsatisfactory one. A conference was held at Barnsley early in last week for the purpose of considering the best means of improving the position of the men. It was resolved to federate the three existing South Yorkshire Unions, and urge the men to work only eight hours per day; all men and boys out on strike to be supported. The most important of the proposition will be hard to carry into effect, as the men are now only working about three or four days per week, and are doubtless desirous of making all they can when the trade allows them to work. With regard to the promise held out to support the men, it is well known that none of the collieries have any surplus stock, and the South Yorkshire Coal and Coke Colliery is still closed, and will be unless the miners choose to submit to 10 per cent., and all underground labourers to a similar reduction. The owners would, however, reopen the pit if the colliers engaged in the Thornecliffe, Parkgate, and Silkstone seams would agree to sacrifice 5 per cent. and the other underground workmen 10 per cent. The men have declared not to concede the reduction. The Wheatley Wood pit, belonging to the Woolley Coal Company, between Wakefield and Barnsley, is still closed, and likely to be so, as the owners are removing the rails and timber from the underground workings.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The shipments of coals from the Tyne and Wear were rather kept behind last week through stormy weather at sea; but notwithstanding this fact, the quantity of gas coals sent coastwise and abroad by steamers and sailing vessels has been an average. Some contracts have been made for the supply of gas coals over the winter. The price was fully up to recent quotations; but a slight advance was reported in some instances, though if there was it was very slight indeed. The market is pretty strong undoubtedly, but there is too much competition amongst medium and second-class collieries for the market to be forced. The steam collieries are working pretty well, but the second-class establishments have steam, are quoted at a low figure. The business doing in coke for exportation shows an improvement as the autumn draws on. Shippers are wishing to get their orders away to the Baltic whilst the fine weather lasts.

The coasting business of last week exhibited something like a rise of 3d. per ton in freight all round. This is usual in September. Sailing vessels have been engaged to load gas coals for Dublin and Cork at 7s. per ton. Ships of medium size have also been taken to carry gas coals to the southern ports; the steamers which ply in the gas trade to London and the larger ports over the year are fully employed. The large gas-works on the Continent are making up their stocks.

Iron manufacturers and merchants are greatly disappointed with the position of their trade this autumn. It has fallen quite short of expectations. Finished iron is sold at lower prices than it was a week or ten days ago. The prospects are not good. A few more inquiries and orders have been received for cast-iron pipes; otherwise there has been no change in the ironfoundry branch. The season is fast running through for the exportation of fire-clay goods. The best houses, however, do not experience any falling off yet, but second-class establishments have difficulty in keeping themselves supplied with orders, and they ask lower prices.

A reaction has occurred in the lead trade. Prices are nearer £2 than £1 lower than they were a month ago, and the market has a drooping tendency. There have been arrivals of lead from the mines of Spain, Germany, and the United States. The position of the general manufacturing trade of the North of England is not unsatisfactory in many respects, as the business which is transacted is for *bona fide* sale. Chemicals continue to be low in price, and the market is singularly inanimate. There appears to be a scarcity of business from the Continent, and prices did not alter last week. At the same time, stocks are low.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

It has just been resolved by the Bathgate Municipal Authorities to make no extensions of the gas-works under their management as will fit them for supplying the town with gas made in the usual manner from coal. This action on their part has been rendered necessary by the determination on the part of Young's Paraffin Light and Mineral Oil Company to decline making gas for the town any longer. The late Mr. Macdonald, who for many years the lighting material for Bathgate has been the residual gas of the shale oil manufacture, that product of the distillation of shale which has hitherto practically refused to yield any condensable oils or light hydrocarbon spirits or naphtha.

The Thurso Gas Company have made a commencement with the laying of pipes, the first time work on the new works that have been made some time in progress. It is expected that the operations will be finished early next month, when the gas will in all probability be turned on by Sir Tollemache Sinclair, Bart., M.P., arrangements having been made to extend the gas supply to the Thurso Colliery, the hon. baronet's residence, as also to several streets of the new town.

A good deal of interest has been excited during the past week by the proceedings in the Valuation Appeal Courts throughout Scotland. There were several cases in which appeals were made against assessments on gas-works. One appeal was made on the part of the Joint-Stock Gas Company, Falkirk, against the valuation which had been made by the assessor on their property as a going concern. The proposed assessment amounted in all to £576, which it was mentioned, was the highest in Falkirk, excluding the Falkirk Iron-Works, and besides that amount there was an assessment of £1000 on the Thurso Colliery, the Company and the assessor. Eventually the valuation was fixed at £1000, being a rise of £500. Such an increase will probably influence the price of gas in an upward direction next year. At present it is 3s. 4d. per 1000 cubic feet. The valuation put on the Penicuik Gas-Works was £685, or nearly the same times was made on the part of the Joint-Stock Gas Company; but after the matter was discussed at some length it was repelled by the Court, the assessor stating that the assessment had been made in the usual way. The most important case brought forward in the Dundee Burgh Appeal Court was one in which the Gas Company were assessed at £1000, and the assessor made the rate for Glasgow of 1850. On behalf of the appellants, their Clerk, Mr. Thornton, asked that a deduction of 15 per cent. should be allowed on two-thirds of the working expenses, as tenants profits, reducing the sum to £10,896; and that there should be a deduction for repairs, renewals, or insurances. A very long debate took place, and the sum of £10,896 was reduced to £14,000. On examination of some length and the result was that the Court reduced the valuation to £14,323, which did not satisfy Mr. Thornton, who intimated that he would appeal to the Court of Session.

Considerable anxiety still exists in regard to the condition of Knoweside reservoir, an important part of the new water-works for Glasgow. It has been found to be sinking apparently beyond all hope of remedy. It has been in the hands of the engineers and contractor for about two years and a half, and during all that time it has never yet been filled. The aim of the engineers was that it should contain 6 million gallons, or a supply for 15 days. The water is present supplied by a siphon pipe from the Caddon direct, from a point to the north-west of Knoweside reservoir. It is the intention of the Town Council to visit the works in a body, and inspect the leaking reservoir along with the engineers, Messrs. Leslie, Edinburgh.

At a meeting of the Finance Committee of the Edinburgh and District Water Trust, held on Friday, the Treasurer's estimates were generally approved of, and the Committee agreed to recommend that the assessment should be at the rate of 9d. per £1 of rental for the domestic water-rate, being 1ld. of an advance on that of last year; 3d. per £1 as shop rates; and 4d. per £1 for the present supply for the water supply. The rate, it was thought by the Committee that this was not a suitable time for making any reduction in the price of water supplied to manufacturers for manufacturing purposes, and upon that subject it was agreed that no recommendation should in the meantime be made.

The annual visitation of the Aberdeen Waterworks was made by the members of the Town Council last Wednesday, one of the company being Mr. Washington Lyon, Chairman of the General Purposes Committee of the Common Council of the City, who is now visiting Scotland to inspect the various systems of water supply for the large towns. At the luncheon which followed the inspection, the Chairman of the Water Committee, Ballic Donald, said that when the water supply scheme was started the domestic water-rate stood at 1s. 3d. per £1 of rental, whereas at the present time it was only 7d., and it was most probable that next year it would be reduced to 6d. The Dundee rate was stated to be 1s. 4d.

There was a rapid decline in the price of pig iron last week, amounting in all to 2s. 8d. per ton. The market closed on Friday with the price at 50s. cash and 50s. 2d. one month for buyers, and sellers asking 1d. higher. Manufactured iron is quiet, and prices are a shade easier.

No further change of any marked importance has taken place in the coal trade. The strike has quite collapsed, and prices are now declining.

LUTON WATER COMPANY.—The ordinary general meeting of this Company was held on the 27th ult.—Mr. Mees in the chair. The report presented by the Directors stated that the accounts for the half year ending June 30 showed a balance of net profit of £1154 5s. 8d., as against £1014 10s. 7d. for the corresponding half of last year. The balance sheet showed a balance of £1000 carried forward from last half year—£93 14s. 2d.—and deducting the interest paid on mortgage loans, and Directors and Auditors fees, there remained for disposal £1120 17s. 10d., out of which the Directors recommended the payment of the maximum dividend at the rate of 10 per cent. per annum, carrying forward to the next half year a balance of £1000. The Directors reported that the application recently made to the Board of Trade, under the Gas and Water Works Facilities Acts, 1870 and 1873, for an Order to empower the Company to raise additional capital, had received the Royal Assent. The Company's Engineer reported that the plant and works were in fair working order. In moving the adoption of the report, the Chairman remarked upon the rapid progress and financial success of the Company, and congratulated the Shareholders on obtaining authority to raise £15,000 more capital, paying 7 per cent., without any opposition or difficulty. With reference to the new capital, he stated that the Company had been successful in obtaining a loan of £15,000 from the Bank of England, and that the application recently made to the Board of Trade, under the Gas and Water Works Facilities Acts, 1870 and 1873, for an Order to empower the Company to raise additional capital, had received the Royal Assent. The Company's Engineer reported that the plant and works were in fair working order. 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REDUCTION IN THE PRICE OF GAS AT CONISBOROUGH.—The Directors of the Conisborough Gas Company, Limited, have given notice that, from the 1st of Oct., the price of gas for private consumption will be reduced from 6s. 8d. to 5s. 10d. per 1000 feet.

PROPOSED PURCHASE OF THE NEWTOWNARDS GAS-WORKS BY THE TOWN COMMISSIONERS.—The Newtownards Town Commissioners having had under consideration the question of taking over the gas supply, they appointed Mr. A. Silverthorne, C.E., to act for them in valuing the works of the Gas Company. He and Mr. G. Anderson (on behalf of the Company) entered upon their inquiry on the 10th inst., and on their joint report the Commissioners will determine whether or not they will pursue the matter further. The price charged for gas is 7s. 6d. per 1000 feet—a price which the Commissioners consider too high, and which they hope to be able to reduce to 6s. 6d. per 1000 feet.

BARNSTABLE WATER COMPANY.—The half-yearly meeting of this Company was held on the 30th ult.—Mr. H. K. Thorne in the chair. The Directors reported that the revenue account for the half year ended June 30 last showed a balance of £803 18s. 5d. After providing for the cost of reconstructing the head weir, there would remain £429 3s. 9d. to be appropriated as the Shareholders might determine. The Directors recommended the declaration of a dividend of 9s. per share, leaving a balance of £89 3s. 9d. to the credit of the next half year's account. The Chairman, in moving the adoption of the report, said he thought the increased dividend would commend it to the Shareholders. The dividend for the last year resulted in 8s. per share, and the Directors considered the considerable expenditure had been incurred in various parts of the works. The Directors hoped that now they had reached 9s. per share they would be able to keep it to it. The motion was carried, and the dividend recommended was declared. A vote of thanks was passed to the Chairman, and the meeting terminated.

SOREHAM WATER COMPANY.—An extraordinary meeting of this Company was held on Saturday, the 11th inst.—Dr. Fuller in the chair. A report was read from the Directors, stating that in consequence of the large increase of the business of the Company, they had been obliged to lay down a much larger quantity of pipe than originally contemplated, the expense of which, added to the cost of the works, had become enormous, necessitated the raising of further capital. The Directors, therefore, recommended that a sum of £2000 be raised by the issue of 5 per cent. preference shares, and a further £2000 by way of mortgage, on the security of the undertaking. The Chairman, in moving resolutions carrying out the recommendations of the Directors, congratulated the Shareholders upon the success of the Company's operations. There was, he said, not the least doubt that the revenue of the Company would be ample to provide the interest and dividends on the mortgage and preference stock, and leave a balance sufficient to pay the original Shareholders a substantial dividend. The new work had already commenced, and the remuneration, and the facilities capital required, would be met by the issue of the shares upon which a revenue would immediately accrue. Formal resolutions were then adopted in accordance with the recommendations of the Directors, and the proceedings concluded.

CAMBORE WATER COMPANY.—The half-yearly general meeting of this Company was held on the 26th ult.—Mr. W. Cole in the chair. The Directors in their report congratulated the Shareholders on the increasing success of the undertaking. The half year ending June 30 showed a considerable improvement on all preceding ones. The revenue account, with all expenses fully charged, showed a profit on the six months working of £277 12s. 4d., against £235 9s. 5d. for the previous half year; and, allowing for the year's net reserve fund, their share of the profit was £219 17s. 3d., in excess of the corresponding six months of 1879. The very large increased consumption of water, together with the unusual drought during the spring and early part of the summer, had tested the Company's capability of supply, and the Directors were pleased to state that at present they had no reason to anticipate any such change in the future. They recommended that a dividend of 4 per cent. per annum be declared. The Chairman, in moving the adoption of the report, mentioned that the 4 per cent. dividend recommended would absorb £224. The profit made was within a very pound of 5 per cent., and he hoped the Directors would be able to pay a dividend of 5 per cent. for the next year. He said he had no doubt they would be able to do better in the future. The report was adopted, and the dividend recommended agreed to.

STOCKTON AND MIDDLESBROUGH CORPORATIONS WATER SUPPLY.—At the monthly meeting of the Stockton and Middlesbrough Water Board, held on Monday, the 13th inst.—Mr. T. H. Bell in the chair—a long discussion took place upon the report which the Joint Clerks handed in, relative to the possibility of carrying out the Board's plan for the acquisition of the purchase of land, pumping facilities, &c. The Chairman said he would suggest the Board coming to some determination as to the probable future growth of the district and its water requirements, and then ask their Engineer (Mr. Mansergh) as to the best mode of providing for those requirements. He thought it probable that allowing for an increased consumption of 20 million gallons of water per week over the next 10 or 15 years would be near the mark; or, in other words, that in the year 1900 their consumption would be about 80 million gallons. In the scheme of 1876 very much more water was asked for than was required; but this they no longer use, as they are now carrying out the same engineering plans then made. He hoped they would meet no opposition if they went to Parliament. Mr. Dodds, M.P., moved—"That the respective Corporations be requested to consider the report from the Joint Clerks, and what action should be taken thereupon." Alderman Bulmer opposed the motion, and invited the Board to refer the matter to Parliament. Several other propositions having been brought forward, it was eventually agreed that Mr. Mansergh be instructed to consider and report to the Joint Clerks, and advise the Board at an early date what he considers the best course to adopt to meet the requirements of the district, supposing the demand to reach 80 million gallons per week in the next ten years.

SEVENOAKS GAS AND WATER SUPPLY.—At the meeting of the Sevenoaks Local Board on Monday, the 6th inst.—Mr. H. Thompson in the chair—Major German moved a resolution to the effect—"That a Committee be appointed to consider and report upon the present and future supply of gas and water in Sevenoaks, and on all matters relating thereto." He thought all the members of the Board would find approval having some enquiry into the present and future supply of gas. One of the grounds he went upon was that they were paying a great deal more for their gas than they ought to do, also that an intimation had been given to him that the Gas Company intended to go to Parliament next session for further powers. Therefore they had better bestir themselves to get the price of gas reduced. The price of gas at 2d. per 1000 feet was particularly excessive to small consumers, although it was not so bad to the large consumers, who were allowed 10 per cent. off their accounts, and if the Committee were appointed they would be able to find out the prices charged in towns similarly situated to themselves. He had found that there was much difference as to the carriage of coals so far as the two places were concerned. The Company, after taking the reasonable profit they were entitled to, ought

to supply gas at 8s. 6d. per 1000 feet, and if the Board would show the same attitude he thought they would get what they wanted, while the Company would not think of going to Parliament for further powers. Mr. Bowen seconded the motion, and it was unanimously agreed to. Major German then moved a resolution with regard to the water supply. Mr. Bowen was opposed to the appointment of a Committee on this subject, thinking that the question of the gas supply should be disposed of first. This being the general feeling, the resolution was withdrawn, and the Board proceeded to other business.

ANOTHER DRAINAGE DIFFICULTY AT HORSHAM.—Under this heading the *West Sussex Gazette*, in last week's issue, says: "The Local Board of Horsham seem to be most unfortunate in their drainage scheme. Having just completed an abstraction case, arising out of damage to land in carrying out the drainage, they are faced with another case of a very serious difficulty arises. In their anxiety to purify the town it appears that the Local Board have managed to pollute the River Arun to such a degree as to be highly dangerous. We learn that a hastily convened meeting of the Board was held on Thursday evening, to take into consideration a letter received from Mr. A. C. Coole, a local Solicitor, on behalf of Mr. John Stanford, of Broadbridge Mill, calling the attention of the Board to the fact that the River Arun was contaminated to a dangerous extent by an overflow of sewage matter from the Board's works; that the fish were killed and floating dead upon the top of the water in large numbers, in consequence of which the water was unfit for drinking, and the water was so filthy as to be a nuisance. That such a nuisance does exist was testified to by no less a person than the Medical Officer of the Board, who said that there could be no doubt about the matter. The river was terribly polluted, and the pollution was caused by the sewage matter. The sewage was gradually getting worse and worse, and the smell was most objectionable. The sewage water could be seen till it came to the Board's sewage works, and, at the works, he must say that things were in a most unsatisfactory state—the sewage had washed away a portion of the bank, and was overflowing into the works; the filtering-beds had not been emptied for some time; and, in his opinion, the sewage matter was getting into the river at three or four different points. Such a state of things is very distressing. Some attempt was made to cast the blame upon the Gas Company, but they were proved to be innocent in the matter. Then it was said that several householders had neglected to drain into the sewer, and drained directly into the river by means of an old drain. Whatever may be the cause, there is no doubt as the Chairman of the Board remarked, it is the duty of the Board to grapple with the difficulty. This they expressed their intention to do, and we hope they may be successful. Since placing themselves in the hands of 'eminent engineers,' the Local Board of Horsham seem to have had their hands full. We wish them and the ratepayers well out of their new difficulty."

SOUTH ESSEX WATER-WORKS COMPANY.—The ordinary general meeting of this Company was held on the 24th ult.—Mr. W. C. Fooks in the chair. The Secretary (Mr. C. J. Fox) presented the report and accounts, from which it appeared that the working of the undertaking for the half year ending June 30 last resulted in a very large profit. The extraordinary expenditure which had been incurred. The total balance to the credit of the profit and loss account for the entire year amounted to £645 17s. 1d., without bringing into account any Directors or Auditors fees. The provision of additional engine power had become a necessity of the undertaking, and an extraordinary outlay of about £400 on this account would have to appear in the next half year's account. The Directors were fully convinced that important alterations, both in reference to mains and storage, involving considerable outlay, had also become necessary, both with the view of increasing the facilities of supply and reducing the cost of the water; but the Directors proposed to call in additional engineering advice before committing the Company to any such outlay. The works for this purpose and the outlay thereon would in all probability necessitate an application to Parliament for additional powers, and if such an application were made the Directors contemplated that they would be able to undertake the works in the next half year of the Company's district. Before this, however, the Shareholders would be consulted, and the views of the Directors fully explained at a special general meeting. The Directors had, as hitherto, been watching the proceedings in Parliament upon the question of the Metropolitan Water Supply, and the Directors intended to call in the next half year of the Company's district that might be conducive to the advantage of the Company. In the present condition of the Company's finances there was no sufficient margin on which the Directors could recommend the payment of a dividend. They however, reminded the Proprietors that the undertaking now produced a large profit, and that the demand for water in the district afforded substantial encouragement for perseveringly adopting, under judicious advice, every possible means of meeting the demand in such a manner as would yield a profitable result to the Shareholders. The Chairman having briefly touched on the items of the report and accounts, moved their adoption, which was carried, and the proceedings terminated.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 3755.—SINGLETON, T., Over Darwent, Lancs., "Improvements in taps or cocks for water and other fluids, steam, and gases." Sept. 3, 1880.
- 3607.—JENNER, H. W. T., Handsworth, Stafford, "Improvements in gas-engines." Sept. 4, 1880.
- 3624.—LAKE, W. R., Southampton Buildings, London, "Improvements in apparatus for the manufacture of gas." A communication. Sept. 6, 1880.
- 3626.—JACKSON, F., Nottingham, "Improvements in pipes and pipe joints." Sept. 7, 1880.
- 3630.—PHELPS, D. B., Bonington, N.B., "Improvements in and connected with apparatus for governing or regulating the flow or pressure of illuminating gas." Sept. 7, 1880.
- 3630.—WOODWARD, J., Manchester, "Improvements in valves for gas and other fluids." Sept. 8, 1880.
- 3641.—GROTH, L. A., Finsbury Pavement, London, "Improvements in the method for decomposition of salts of ammonia, and in apparatus used therefor." A communication. Sept. 8, 1880.
- 3678.—FOULIS, W., Glasgow, "Improvements in apparatus for purifying and cleansing gases, the same being applicable for separating gases or vapours from liquids." Sept. 10, 1880.
- 3681.—STEELE, A., Worcester, "Improvements in the manufacture of heating and illuminating gases, in the apparatus to be used in such manufacture, and in the means employed for the incandescence of the said gases." Sept. 10, 1880.
- 3685.—WILLIAMS, L., and MALAM, J., Southport, Lancs., "Improvements in the method for the manufacture of gas in a retort engine." Sept. 10, 1880.
- 3695.—PARKER, J. F., Gravelly Hill, Warwick, "Improvements in the manufacture of gas for illuminating and heating purposes, and for melting and reducing metals from their ores." Sept. 10, 1880.

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TO CORRESPONDENTS.

W. M.—Have not had time to get the necessary illustrations prepared for this week.

T. S.—The fire was the result of the rapid oxidation of the impure material on exposure to air. You should not leave it in the purifier so long after it requires to be cleared away. No danger will arise if the foul lime is always removed from the purifier as soon as possible after it is thrown out of work.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 28, 1880.

Circular to Gas Companies.

THE report of the Directors of the Commercial Gas Company, with the statement of accounts for the half year ended the 30th of June last, has been issued in anticipation of the ordinary general meeting of the Company to be held on the 1st prox., and as the Directors are enabled to notify their intention of advising the payment of the same rates of dividend as were declared in April last, the result of the half year's working must be considered as being very satisfactory to the Shareholders. Precisely the same amount, £34,600, is set aside for payment of dividends for the past half year as for the same period immediately preceding, there having been no increase in the interest-earning capital of the Company, although a fresh issue of stock has since been made, as advised at the April meeting, and a portion of the amount appears to have already been paid in. With an initial price under the sliding scale of 3s. 9d. per thousand cubic feet, the Company have for a year past been selling gas at 3s. 3d., and, therefore, are strictly entitled to divide one and a half per cent. over the standard dividends of ten per cent. on their old, and seven per cent. on their new stock. But the necessity of providing for the regular addition of £6200 to the credit of the insurance-fund, which was established in accordance with

the Commercial Gas Act of 1875, and of paying £1575 interest on debentures, induce the Directors to advise the payment of eleven and a quarter and eight and a quarter per cent. respectively on the old and new stock, leaving a balance to be carried forward. The increase in the Company's business, when compared with the corresponding period of the previous year, although amounting to the respectable addition of something over 31 million cubic feet to the total amount of gas sold, was not quite so great as the increase of the first half of the year 1879 over the same period of 1878. But an improvement is apparent in the quantity of gas sold per ton of coal, as given in the present statement of accounts, when compared with the corresponding period last year, the increase amounting to 340 cubic feet per ton. The gross receipts for gas were about £30 less than during the six months ending June 30, 1879, although the price was twopence per thousand feet lower, while the receipts for residuals were nearly £5000 more. Bad debts show an increase, but law charges almost disappear, and the Company must be considered as having transacted their business very smoothly, when it is observed that their legal expenses for six months have not amounted to £3 in all. On the whole, the Company must be congratulated on having made steady progress during the half year, both in extending their business operations and in their internal administration. Their district is perhaps not the most desirable one in some respects, but it allows ample scope for doing a good trade in gas and residuals. The position of the Company is well secured, and, to our way of thinking, it has at least not been weakened by recent legislation.

The report of the Directors of the London Gaslight Company has also been issued this week, the general meeting of the Company being announced for the 6th prox. There is a fine old flavour, not, however, in this case tinged with mustiness, in the published accounts of the proceedings of a Company which alone, among all the lessening number of Metropolitan Gas Companies, works under the system of maximum dividends, and appears to do very well under conditions which its neighbours have either willingly cast aside, or had forcibly stripped from them. How long this unique specimen of a gas organization, belonging to a class which, whether for good or for evil, is fast becoming extinct, will retain its lonely position, it is not for us to inquire. We, like other interested spectators, must await the issue of events, with the belief that the conflict of the new and the old must end sooner or later in the usual way; but we refrain from indulging in any prophecy respecting the possible circumstances attending the issue. For the present it is announced that a dividend after the rate of ten per cent. on the ordinary stock of the Company will be recommended at the meeting, from profit made out of gas sold at 3s. 3d. per thousand feet—the same price, be it noted, as is charged by the Commercial Company. The receipts for gas have increased nearly £4000 over those for the corresponding period of 1879; but, on the other hand, the coke and breeze sales show a falling-off of rather over £4000. Turning to the working statements, there is an increase of about 22 millions of cubic feet of gas sold as compared with the corresponding period of last year; and the quantity unaccounted for, although showing some increase, is still proportionately low. The Company have no insurance-fund, but their reserve-fund stands at £76,762 7s. 4d. It may be remarked, by way of explaining the position of the London Company with respect to capital and profits, that they have as yet £111,693 of ordinary "A" shares, bearing interest at the rate of 6 per cent. per annum, not called up, and they have power to borrow £81,305 more. They are empowered to charge 4s. 6d. per thousand feet for twelve-candle gas, if required for securing their maximum dividends; and their ordinary stock is not large. Their works are, moreover, very complete and well appointed. Considerations respecting the land at their disposal and the geography of their district prevent their prospects being altogether rose-coloured, though enough has been said to show that they are not yet in desperate case—in fact, in many respects they possess valuable advantages; but, as we have already said, time is against them as an independent organization. With these remarks we leave the subject until we shall have occasion to deal with what transpires at the impending meeting.

At the ordinary meeting of the Harrow District Gas Company, held on Wednesday last, the Chairman, in moving the adoption of the report, which among other things recommended the payment of a dividend at the rate of six per cent. per annum, referred to the stimulus that the new railway was

generally expected to give to the business of the locality, and, consequently, of the Company. The price of gas in Harrow has been 6s. per thousand cubic feet, and it was at one time feared that this was a stereotyped figure; but the Directors have acted wisely in giving notice of a reduction in price, although they have only reached a six per cent. dividend. If they continue to court an extended consumption in this way, now that there is a probability of more business flowing in upon them, it will, perhaps, not be long before they will be able to sell gas still cheaper, and realize higher dividends.

The report of the Directors of the Shrewsbury Gaslight and Coke Company, presented at the annual meeting of the Company on Thursday last, was remarkable as announcing a year of successful working unprecedented in the history of the Company. For twenty years the normal increase in their sale of gas was about $2\frac{1}{2}$ million cubic feet per annum, but last year the increase was between 5 and 6 million cubic feet. This was principally due to the circumstance that by a reduction taking effect from September last, the price of the Company's gas was lowered to 3s. per thousand feet, which it is needless to say is less than has ever been charged in Shrewsbury. The elasticity of revenue following this reduction was so marked in the present instance that instead of a loss of £800, which the diminution in price appeared to entail at the time when it took place, the accounts for the year actually show a gross increase of £550 in the gas-rentals. This is a very notable illustration of the result of cheapening gas, for the circumstances of the locality are not such as to indicate a rapidly expanding consumption under ordinary conditions. The Company have also effected a considerable saving in the proportion of unaccounted-for gas, which from 7.15 per cent. has been reduced to 5.31 per cent.—a very fair success for one year's exertions in this direction. The Company's stock now pays a dividend after the rate of seven and a half per cent. per annum, and their position is prosperous and promising.

There is some dissatisfaction at Mile End respecting the leakage of gas from the street-mains. There are two discontented parties in the case—the Vestry, as representing the inhabitants, who are annoyed by the smell of the escaping gas; and the unfortunate Gas Company, who suffer the loss of the gas, and have also to bear the expense of finding and stopping the leaks. A third person, at a recent meeting of the Vestry, when the matter was discussed, put in a claim to be considered aggrieved thereby, and this was the Surveyor to the Vestry, who complained that his own exertions and the outlay of public money in making and repairing roads were both frequently thrown away, in consequence of the Gas or Water Companies coming, directly after a road had been made perfect, and digging it up again. This is a sore point of ancient standing between highway authorities and people who have to lay down pipes in the roads, and as long as things remain as they are, and considerations of the convenience of one section of the community render it unavoidable that the convenience of another, or perhaps the same section in another capacity, should be occasionally interfered with, the dispute will continue open. But in this as in most sources of contention, mutual concessions may do much to eliminate its bitterness. District Surveyors and their employers must know that Gas Companies and others do not break up roads without cause, and as to the general disturbance of a highway for the purpose of finding out leaks in gas-mains, it must be remembered that this is frequently rendered necessary by the very means employed by the road makers for perfecting their work. Gas-mains are occasionally imperfectly laid, and consequently leak, necessitating extensive repairs at some subsequent time; but this does not often happen with wealthy and well-managed Gas Companies. It is more frequently found that subsoil sinks or is washed away, old drains fall in, or a heavy roller or unusually heavy traffic passes over mains previously sound, and the consequence is a general leakage, causing annoyance to residents in the neighbourhood, and entailing trouble and loss on the Gas Company. But in all this the Company is not solely to blame, and Road Surveyors should not assume so frequently as they do that the road itself is always perfect, and that the fault lies entirely with the pipes.

The quarrel between the Bedford Town Council and the Gas Company is getting deadly. First, the Council attacked the Company on the question of the illuminating power of the gas supplied by them, and a Committee of the representatives of the injured "ratepayers" was constituted to exercise the functions of gas examiners, the result of their labours being failure to convict the Gas Company, or to appease the malcontents, and the addition of a vague feeling of having

made an exhibition of themselves, to the previous discontent of the Council. Having abandoned the attempt to instruct the gas officials in the manner of testing gas for illuminating power, the Council next charged the Company with supplying sulphuretted hydrogen with their gas. These charges of defects in manufacture soon, however, gave place to a graver indictment, having direct reference to the manner in which the Gas Company kept their accounts. The Gas Committee of the Town Council have reported that they consider the accounts furnished by the Gas Company to be very imperfect, and not in accordance with the Gas-Works Clauses Amendment Act of 1871. The Company will probably contend that in the matter of accounts, as in that of the method of testing for illuminating power, they follow their own private Act, as they have always done hitherto; but the Council have already expressed their intention of judging the Company by the light of the general legislation of 1871. The Gas Committee hazarded the opinion, in reference to the accounts supplied to them, that there was a sum of £20,000 not accounted for; but, evidently feeling insecure on the question of book-keeping, they wished for power to appoint a qualified Accountant to examine the Company's books. The matter was, however, eventually adjourned for a fortnight, during which interval every member of the Council is to have an opportunity of exercising his acuteness in unravelling the alleged complexity of the accounts, and consequently we may expect, at the expiration of that time, to be informed of the next action to be taken by the Council.

A curious little dispute on the bill for lighting the public lamps has divided the Town Council of Clitheroe. The gas-works belong to the Corporation, and the account in question was made out for a certain amount, by whom does not clearly appear, for the next thing mentioned is that the Gas Managing Committee reduced it by about £40, and recommended it to the Council for settlement. Meanwhile the Lighting Committee, who had not been consulted in the matter, wanted to reduce it still more; but the Gas Committee pressed for payment. When the matter came before the Council, exception was taken, with much reason on the part of the Lighting Committee, against the principle of a Committee passing their own accounts for payment, and they therefore wished to have the unfortunate little bill referred back to them for curtailment. The whole dispute is, of course, trivial, being merely a difficulty as to which pocket a few pounds belonging to the same owner should be carried in; but, as a worthy Alderman remarked, it showed that the members of the Council must quarrel with some one, and having now no Gas Company to quarrel with, they fell out among themselves, probably by way of diversion, and in memory of old times. Eventually the account was passed, a proposal to "split the difference" being rejected, perhaps because such a rough-and-ready proceeding was thought inconsistent with the settlement of a question of principle.

To-day the Exhibition of Apparatus used in the Production of Artificial Light will be opened in Glasgow, and if the preliminary announcements referring to it are justified by accomplished facts, the exhibition will mark an era in the modern history of illumination by artificial means. Such, at least, has been the expressed intention of its promoters, who have done their utmost to give their enterprise a more than local importance. We shall soon see whether their efforts to surpass not merely everything of the kind that has yet been seen in the North, but also anything hitherto held in any part of the United Kingdom, have met with a deserved success; or whether we shall have to chronicle another local exhibition, larger perhaps than usual, but without general interest. From such a lame and impotent result we most sincerely trust their good fortune has shielded Mr. J. Mann, the Secretary, and the Committee who have been charged with making the necessary arrangements.

The Fourth Congress of the Sanitary Institute of Great Britain, which, as stated in another column, was opened in Exeter, under the presidency of Earl Fortescue, on Tuesday last, was signalized by the inauguration of an exhibition of sanitary appliances and gas cooking apparatus, the latter class of exhibits being under the auspices of the Exeter Gas Company, who have offered medals for the best cooking stoves. The exhibition was held in the new abattoirs built by the Exeter Corporation on ground purchased from the Gas Company, and lately the site of the old gas-works, which were among the earliest constructed on the introduction of gas lighting. After the exhibition had been formally opened, the business of the Congress commenced with the delivery of the President's Inaugural Address, which dealt principally with matters relating to public health. In one portion of

his address, however, the President mentioned the subject of monopoly with respect to gas and water supply, and it was with evident self-congratulation that he brought up certain remarks made in the course of a lecture delivered by himself in 1845, and used them to express his views on the present occasion. It is not every man who could safely quote the opinions he may have expressed thirty-five years ago concerning an economical subject, without finding it necessary to modify or repudiate them. It is creditable to Earl Fortescue's early acumen that he at that time distinctly maintained the inapplicability of the principle of competition in trade when the supply of gas or water is in question. It may be remarked, in amplification of Earl Fortescue's reasons for this conclusion, that the large proportion of capital sunk in fixed works by Gas or Water Companies may be considered as so much given by way of guarantee or "hostage to fortune." For the protection of this sunk capital a local monopoly is needed, but it cannot be said that the useful check of competition is altogether wanting in such cases, for although it cannot be applied in the same place, it is always at hand in the records of similar contemporary enterprises elsewhere. That this corrective should more frequently be applied by the consumers, by way of threat to the monopolists, and appropriated by the latter under the influence of care for their own continued existence, rather than for the mere sake of doing their best for their customers, is perhaps only natural on both sides, although there are many honourable exceptions to the rule that monopolies create selfishness and inactivity. There is little to find fault with in Earl Fortescue's ideas respecting the propriety of gas and water undertakings becoming the property of the public, with due regard to the interests of the first adventurers in such enterprises. The opinion expressed by the President in 1845 respecting the best method of managing this class of property when finally vested in the public—that they should be rented to contractors—needs, however, an amendment which does not appear to have been made. No one at the present day would advocate dealing in this way with such necessities of life as gas and water. For tramways, or property of the same character, involving the use of much floating capital, private interested management is probably the best, though even this is open to question; but we cannot think that with Earl Fortescue's mature experience he was speaking with his usual care when he neglected to correct the false impression made by his earlier words. It may be regretted that he did not touch upon the subject of the proper use of the profits derivable from public property in gas or water. A sound exposition of this much-debated problem would have been valuable, and might have taught us the extent of Earl Fortescue's progress in the economics of local self-government since 1845, which is not so clearly manifested as might have been wished. Beyond this somewhat historical comment on one of the principal points of interest in the corporate management of gas and water supply, the address contained no general reference to gas undertakings.

SERGEANT SARGOOD who, as many of our readers will remember, a few years since played a very prominent part in Parliamentary Committees on Gas and Water Bills, and whose name was constantly appearing in our pages, died suddenly at Frankfurt, on the 14th inst., of apoplexy of the heart. The deceased gentleman was 65 years of age at the time of his death.

The Manchester Corporation Gas Committee recently advertised for an "efficient draughtsman who has a thorough practical knowledge of gas-works, and is competent to undertake the preparation of plans in connection with the construction and alteration of the various works and apparatus used in the manufacture of gas, and who has a good knowledge of general engineering work." We understand that Mr. Herbert Hutchinson, a native of Barnsley, and son of Mr. John Hutchinson, who for nearly 30 years has had the management of the gas-works there, has received the appointment, and commenced his duties on Monday last week.

THE WATER SUPPLY OF SKEW.—In 1875 the Stroud Water Company obtained an Act for supplying the borough with water. No steps were taken under it till this summer, when a few days before the time specified in the Act expired, works were energetically set about under a new directorate and staff. A large well has been sunk at Chalford, from which 15,000 gallons per hour are pumped, and a few houses have been connected. It is intended to construct a large reservoir at Minchinhampton, from which the whole borough will be supplied at a cheap rate. The supply will be a great boon, as good water is stated to be none too plentiful.

THE WATER SUPPLY OF PONTYPRIDD.—The Directors of the Pontypridd Water-Works Company have decided to proceed at once with the construction of new filtering-beds and a reservoir. Steps have, we understand, been taken to raise the remaining capital of £4500, £3600 of which has indeed already been promised. This will make a new, and it is confidently believed, successful epoch in the history of the Company. The present filter-beds are undoubtedly inadequate to supply the whole of the large and scattered districts with water, and this drawback, supplemented by the still more important one of long-continued drought, explains the stand, here taken in some places by the ratepayers, and should be remembered that the scarcity of water has of late been matter of complaint throughout the country generally, and the Pontypridd Company appear to have been as much to the fore as any other in devising means for obviating a recurrence of the contingencies complained of.

Water and Sanitary Notes.

FOLLOWING the disquieting remarks of Dr. Frankland in his August report on the Water Supply of London, we now have the official statement of Lieut.-Col. Bolton on the same subject. As usual, the two authorities exhibit a difference upon the main point. Dr. Frankland says: "The Thames water 'supplied to London was of very bad quality,' and 'quite 'unfit for dietetic purposes, owing to the large quantity of 'organic matter which it contained.' Lieut.-Col. Bolton, taking a common-sense view of the situation, says that the state of the water in the Thames at the intakes "was bad "from the 1st to the 3rd of August, when it became good," and continued in that condition for the remainder of the "month." The water in the River Lea is described as being "good during the greater part of the month." These remarks, we are reminded, "refer to the condition of the water "previous to filtration." Generally, the water was efficiently filtered, but it is stated that the Thames water, as supplied to the consumers, was "slightly coloured and tainted by "organic matter." It is explained that this arose principally from the vegetation brought down by the flood waters in the early part of the month. Such matter, when found in the water supply of Glasgow, occasions Dr. Frankland no anxiety, any more than the "previous animal contamination" of the water taken from the chalk wells of the Kent Company. Dr. Mills, of Anderson's College, Glasgow, reports that the water supplied to that city from Loch Katrine during the month of August "was light brown in colour, and contained "much suspended matter." We presume that the Glasgow water might be described in much the same terms as the London supply, if a chemist thought fit to take that course. In either case we have some degree of colour, and a large quantity of organic matter. But in neither case can it be proved that the water is unwholesome, and the death-rate tells in favour of London.

The Town Crier of Derby has involved himself in a singular difficulty with reference to no less a subject than the purity of the water supply of that town. It is alleged that this individual, attired in all the robes of his office, including, we presume, the traditional cocked hat, went round the town ringing his bell and warning all the people that as they valued their existence they should carefully boil the town water before drinking it. As might be expected, this official intimation caused considerable alarm, as well as feelings of surprise. The Corporation have recently come into possession of the water-works, and it was imagined that the supply was perfectly wholesome. On inquiry it was found that the crier had received no instructions from the Corporation for this announcement, and—more strangely still—the crier emphatically denied having made any such proclamation. Nevertheless the voice had been heard, and those who heard it were convinced that it was the voice of the Corporation crier. The Markets Committee took the matter promptly in hand, and after a rigid investigation decided on suspending this mysterious functionary, pending the presentation of a report to the Corporation recommending that he be removed from his post. In the meantime the Water-Works Committee have published a report from Dr. Hehner, the Borough Analyst, showing that "the water supply of the town of Derby is of "excellent quality, the water being practically free from "organic matter, and absolutely so from indications of pollution." Doubtless, if the crier be guilty, as alleged, the offence is a serious one. But in London we take a different view of such matters. Here we have the water "cried down" every month by a gentleman who is not known to wear a cocked hat or carry a bell, and who is not so easily removable as the luckless functionary who is now undergoing suspension. Whether the alarming report originates with a bellman or a scientific chemist, we would advise the public to hope for the best, and not to allow themselves to be easily frightened.

With reference to the high mortality at Leicester—to which some allusion was made in this column last week—Dr. W. Johnstone, the local Medical Officer of Health, has published a statement explaining that the unwelcome phenomenon is occasioned by the large number of deaths among infants. This high infantile mortality occurs periodically, and deprives Leicester of the position it would otherwise occupy as one of the healthiest towns in England.

The Sanitary Congress in Exeter has met with all the success that could have been anticipated by its promoters. The gathering has been large, and the reception given to the sanitarians by the Mayor was extremely cordial. Earl Fortescue, the President, led off with a speech which, if not altogether accurate in some matters of fact, nevertheless had sufficient merit to be interesting. His lordship is far from

being satisfied with things as they are, and deploring the obstinacy of mankind in neglecting the teachings of Mr. Chadwick. The reports of the Board of Health, we are told, had they been adopted, would not only have saved millions to the inhabitants of London, but would also have added immensely to the wealth, comfort, and security of all classes. The London Water Companies ought to have been bought up when their capital was six millions, instead of being allowed to go on to an expenditure of twice that amount. London is also wrong with its drainage, the intercepting sewers being planned on an erroneous principle, and much of the work requiring to be done over again. While deploring the past, his lordship seems to have no very sanguine expectation as to the future. "The centralizing action" of successive bureaucratic Ministries "is impairing the principle of local self-government. Yet his lordship considers it desirable that on certain grave questions some control should be exercised on the part of a central power over the acts of the elected authority. For this reason he objects to the composition of the proposed Water Trust as recommended by the Select Committee. The Metropolitan Board he accuses of "costly mismanagement," the financial notions of the Corporation he deems unsound, and the Vestries he considers altogether incapable. The Earl observes that "the appointment of a practical dictator for a short time to act in a particular crisis was not unknown under Republican Governments, ancient and modern." The noble President of the Exeter Congress would, perhaps, not object to be dictator himself for a short time, or to see his friend, Mr. Chadwick, elevated to that post. Concerning the government of London, his lordship dwells upon "the necessity of State regulation for capitals, as distinguished from mere provincial towns." He would commit "the vast local affairs of the Metropolis" to Imperial control, but with Municipal Authorities to carry out the details. His lordship hopes in this way to combine a species of dictatorship with a due admixture of local self-government. On the whole, it is pretty plain that Earl Portescue has no great faith in the willingness of mankind to submit to sanitary regulations of an advanced type. An equal degree of dispondency was apparent in the remarks of Mr. Rawlinson, who concluded an address on "Engineering and Sanitary Construction" by saying: "We are in the midst of a war *à furor*, and sanitary works can have no solid and satisfactory progress under existing conditions."

According to Professor De Chaumont, the President of one of the Sections of the Sanitary Congress, the fall of the Roman Empire was in a great measure the era of retrogression in a sanitary sense. The Jew had the best of it, as he continued clean, while a mistaken asceticism in the Christian world led to much that was unsanitary. There can be no doubt that of late years there has been a considerable awakening to the value and duty of cleanliness. A very striking paper was read by Mr. H. C. Burdett, of the Greenwich Seamen's Hospital, on the "Unhealthiness of Public Institutions." The facts were remarkable, and it was asked whether the time had not arrived when the Royal Institute of British Architects should take up the subject of sanitary construction, its Council making regulations for the guidance, instruction, and training of the rising generation of architects. A "wide" discussion followed, in the course of which there was a distribution of censure among architects, engineers, and public officers. The last-named class were accused in many instances of being ignorant of the first principles of sanitary science. The workmen in the building trades also came under review, as occasionally executing their tasks badly in order to "make work" for their fellows, regardless of the peril to other people. The desirability of instituting some test as to the qualifications of sanitary officers is a subject which is evidently receiving an increasing amount of attention. An entirely different branch of the subject was discussed a day or two later by Dr. B. W. Richardson, F.R.S., who dilated before a crowded audience on the topic of "Woman as a Sanitary Reformer."

SALE OF SHARES IN THE WORCESTER GAS COMPANY.—On Friday last a number of shares in the Worcester Gas Company were sold at the Company's offices. The 40s. shares realized from 84s. to 84s. 6d., and the 35s. shares sold in the same proportion.

THE WATER SUPPLY OF HAYWARD'S HEATH.—A special meeting of the Hayward's Heath Local Board was held on Tuesday last—Mr. Bannister in the chair—to consider the subject of the water supply. Mr. McKenzie announced that the Cuckfield ratepayers had had the matter under their consideration, and had rejected the scheme submitted to them. Mr. C. O. Blaber having given some particulars as to the cost of the proposed supply, some general conversation on the subject ensued, and eventually the matter was adjourned till the next meeting of the Board.

HERR HASSE, OF DRESDEN, ON THE DETAILS OF GAS GENERATOR FURNACES.

At the last meeting of the German Gas and Water Works Managers Association at Heidelberg, referred to in a recent issue, Herr Hasse, of Dresden, contributed a number of observations of much interest on the construction and management of gas generator furnaces, with special reference to those minor details which invariably afford matter for investigation and comment, when the general nature and form of a novel invention have passed the stage of criticism, and entered that of general acceptance.

Herr Hasse expressly disclaimed any intention of discussing the question of gaseous fuel, which, as he said, had been referred to a Committee for trial some years since; and, although the Committee had never completed their labours, the main object with which they were undertaken had been attained. The principle of gas-firing was proved to be successful in practice, but the apparatus by which this fact was determined would have had to be entirely reconstructed in order to give the highest results of which the system was considered capable. For instance, it was found that the high temperature of the oven necessitated improved fire-clay blocks, and the foundation of the oven should have been much stronger, to avoid the slightest risk of settlement. The arch and inner piers also needed strengthening, and the setting ought to have been wider, to give increased space between the retorts, so as to lessen the friction and loss of draught in passing between them.

There were other defects proved by experience to be serious, and which required removal previous to the extended adoption of the principle. But when to all these troubles is added the difficulty experienced in getting workmen to take kindly to the new order of things, and overcoming their suspicions of the whole system, which they believed would prove injurious to their interests, it will be seen that the strongest convictions of its utility, and the greatest perseverance, were required to keep the matter from being dropped at the outset, and to continue the experiments and remove defects. The generator caused the most trouble. The inclined grate first used required frequent renewal, radiated much heat, and caused great loss of coke in clinkering. The iron bars were then replaced by fire-bricks, but when these also had been partially worn away, they had to be renewed, with a consequent loss of time and money. Another inconvenience experienced with the generators, and especially with those which served for two settings, and were therefore fitted with air inlets on two sides, was the fretting away of the side walls, which were soon burnt through. The fire-bricks could not resist the enormous heat developed where the air entered. This destruction was prevented by giving the walls the shape which they attained by the action of the fire. The upper part of the wall was slightly set back, thus leaving the lower part projecting, so that the air, after entering, was obliged to pass through a layer of coke, instead of going between the wall and the fuel. This device was entirely successful. Again, the air openings in the oven had often been stopped up. This was avoided by leaving a slight projection above them, to prevent any molten material in the oven from trickling down in front of the holes. This seems a very simple matter, but it took a long time to find out. It was, however, still longer before a method was found for preventing the destruction of the fire-blocks which were used instead of a fire-grate; it was at last effected by steam. It is a great step in advance that the generator, at first the weakest part of the whole apparatus, has now been made to last as long as the setting, or, on several settings, without any repairs whatever. The simplest way of using steam for this purpose is by admitting water through slits in the bottom of the generator, the slits being too narrow for coke to drop through. This is sufficient to produce a covering of slag on the fire-block, which protects it from fusion by the fire.

All the defects of gas-firing have, in this way, been gradually removed, so that now, after the lapse of five years since the idea was introduced into Germany, the different "systems" which were at first advocated on all sides have grown so much alike that, in principle, there is no great choice between them, and there cannot be much distinctive claim for one over another. The chief difference that still exists in generators is in respect of their being made for a fixed or a varying height of fuel, which is, after all, a very slight distinction, if the latter variety are charged often.

Herr Hasse does not consider that the manner of admitting air to the generator, through side openings, or through the bottom, or by means of a grate, can make any material difference to its working; except as regards the different qualities of coke in respect of the fusibility of its clinker, which may render one form or another locally preferable. Herr Hasse says that he has himself tried all kinds of generators, and has come to the conclusion that when everything is in perfect order and the workmen know their duty, there is hardly any difference as to results, provided that the apparatus is in other respects well made, and the proper height of fuel maintained. He also states that there can be small doubt that the best place for the generator is immediately before the setting, and beneath the floor of the retort-house, although local circumstances may be permitted to control this part of the arrangements.

Herr Hasse maintains that the notion sometimes prevalent abroad—especially, it may be added, here in England—that generator ovens are unsuitable for small works, is quite a mistake. On the contrary, he affirms that even where a setting has to stand whole days without working, the principle is specially advantageous, for the valve in the gas-flue has only to be shut, or the door before the generator to be closed, in order to reduce the consumption of coke to a trifle, and to prevent the formation of any clinker. The stoker who would in any other case have to constantly attend to the furnace, may therefore be otherwise employed. Although Herr Hasse does not specially men-

tion it, his argument will also apply to the cessation of work in the retort-house on Sundays, which would not form the least powerful incentive to the adoption of the principle in England.

A great disadvantage to be met with in connection with gas-heated retorts, in requital perhaps of the blessings of high and unvarying heats, is the clogging of the hydraulic main, and the stoppage of the ascension-pipes. Concerning this matter it may be said that in England these troubles are not unheard of, although we do not in general heat retorts with gas. Herr Hasse has nothing particularly novel to advise for their removal. He uses wrought iron ascension-pipes of large diameter—nearly 7 inches—or covers up the cast-iron with non-conducting material, and has designed a special form of hydraulic main with diaphragms to permit of rapid extraction of the thick tar. Yet, as he says, these measures are only palliatives, no radical cure being possible while the cause of the evil is persisted in for other reasons. The non-conducting material advocated by Herr Hasse to economize heat, &c., will stand on vertical surfaces such as the outside of the generator, where it is not exposed to rough usage, but when used on the front wall of the setting it is usual to build the wall hollow, and place the non-conductor between.

Herr Hasse preferred settings of 6, with the old furnace, or direct-acting system of firing, but now finds it of advantage to use settings of 7, 8, or 9. Considerable economy of wages, fuel, and space is thus secured, for the larger number require no more fuel than the smaller, so that 9 is now the standard setting instead of 6, as formerly. Herr Hasse has experienced some difficulty in taking off the ascension-pipes from some of the larger settings when the arches were not wide nor the piers very thick. It appears that his experience has not extended to double retorts, since he speaks of surmounting the difficulty by taking off the ascension-pipes of some of the lower retorts at the back end. It may be remarked that with settings of 10 through retorts, as used in some crowded retort-houses in London, the necessary ascension-pipes are provided for at each end without difficulty, although with a greater number of retorts some trouble might be found in their arrangement.

Returning to the generator, Herr Hasse gives a description of the means he adopts to provide steam for preventing the formation of adhesive clinker, instead of, or sometimes in addition to the water supplied through slit blocks as already described. He merely introduces a pipe bent twice forwards and backwards in the bottom flue of the setting, and water being caused to flow through the pipe from a cistern anywhere overhead, the steam produced therefrom by the waste heat of the spent gases is led into the generator. Herr Hasse uses a flap sight-hole door, with planed surfaces, to secure ease of inspection and preserve a draught-tight joint. He also closes the charging mouth of the generator with a moulded fire-clay lid having rounded edges, dropping into a taper casting, the contact between the fire-clay and iron being amply draught-tight, and an iron shield over all leaving the retort-house floor quite even and unobstructed. He prefers this method of closing the generator to a planed lid.

In concluding his remarks, which are instructive as indicating the nature and extent of the every-day troubles of the users of gas generator furnaces, Herr Hasse expresses the hope that his testimony may help to induce gas managers who have not yet adopted the principle to do so without delay, and assures them that the cost of the necessary structural alterations will in every case be repaid. For small works he advocates the adoption of settings with independent generators, while in larger establishments it will be better to make one generator serve two settings. Single generators require only one to two millimetres draught, double generators will need about twice that draught. With reference to this matter, Herr Hasse lays much stress on the advantages to be gained by the use of delicate pressure-gauges in the ordinary working of the settings, as their indications are of the utmost value in controlling the expenditure of fuel. Finally, all those who propose to introduce gas-firing into works already established are cautioned not to be content with slightly altering the existing retort-beuches, but if necessary to build special arches of the strongest description if they desire to obtain the best possible results. With this sweeping recommendation of root-and-branch reform Herr Hasse brings his paper to a close.

Notes.

[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

BENGEL'S SPHEROIDAL GAS-BURNERS.

M. Bengel claims a great and novel improvement in gas-burners of large size, in the construction of his spheroidal burner, by which the gas, instead of issuing from a series of holes, is burnt from a complete circular slit, adjustable in width to any required dimension of flame or specific gravity of gas to be used. According to the statements of the inventor, the spheroidal burner is not liable to be altered in shape by the action of the flame, an effect always observed with ordinary metallic burners, and it is not liable to fracture like stearite burners of large dimensions, while its capability of ready adjustment is an advantage not possessed by burners pierced in the usual way, which must always retain the shape and size at first given them in manufacture. With respect to the illuminating power obtained by the use of the spheroidal burner, M. Bengel states that in the course of a series of experiments having for their object the determination of the condition best suited for the burner, he found that with a consumption of from 75 to 80 litres of gas it

gave a light equal to that of a carcel lamp of the Paris type burning 42 grammes of oil per hour; the City of Paris standard Bengel burner consuming 500 litres to give the same amount of light. A tabular statement of the results obtained from two spheroidal burners, the smaller burning about 710 litres and the larger about 900 litres of gas per hour, shows their average consumption to have been about 78 litres to equal the illuminating power of one carcel lamp. M. Bengel alleges that the powerful double or triple Argand burners with cylindrical chimneys which give the light of a carcel lamp for every 75 or 80 litres of gas consumed, have the disadvantage of giving a red light contrasting unfavourably with the electric light, but that his spheroidal burners avoid this defect, so that if they do not excel others in the actual proportion of illuminating power to gas consumption yielded by them, they give a light of higher quality at an equal cost, while the peculiar shape of the flame itself forms an elegant substitute for the cylindrical or flat-shaped flames commonly used.

THE ELECTRIC LIGHT AND LANTERNS.

A recent number of *Le Gaz* thus sums up the principal defects of the most renowned systems of electric lighting:—*Jablochhoff Candle*: Too much scintillation; no arrangement for relighting automatically in case of extinction; too deep shadows beneath the lamp. *Werdermann Lamp*: Absorption of a great portion of the lighting power by the upper carbon; too frequent changing of the incandescent carbon; too much shadow. *Jamin Candle*: Too much noise; light too unsteady. *Regulators—Serrin, Lontin, Brush, &c.*: Too costly; too much shadow beneath; delicate manipulation. Therefore, remarks our French contemporary, there is still no really practicable system of electric lighting extant except the Serrin or Brush regulators for lighthouses or large works. Beyond this important negative result, the experience of four years working of the electric light in Paris, although aided by large subsidies, much financial support, and a certain amount of public favour, has produced absolutely nothing. In connection with the subject of electric lighting generally, mention may be made of a novel means of rendering globes for use with the electric light sufficiently opaque to diffuse the light, without robbing it of such a large proportion of its illuminating power as experience has proved to be the effect of ordinary opal glass globes. This improvement, which is due to M. Clémendot, consists in shielding the point of light with a close row of glass tubes filled with spun glass threads, of the kind made by M. Brunfaut, and called glass-silk or glass-wadding, of which the single filaments are so fine that they measure only from four to six 10,000ths of a millimetre in diameter. The glass-wool can be made of any colour, and by increasing or diminishing the quantity of the material in the tubes they can be rendered more or less opaque as desired. The effect of the material in diffusing light is said to be similar to that exerted on the rays of the sun by white clouds. The inventor claims to have saved 30 per cent. of light as compared with opal glass globes. Lamps fitted with the new shades are at present in actual use, and are said to be very successful.

PROFESSOR BELL'S PHOTOPHONE.

The invention of the telephone, startling as it appeared at the time, is perhaps more remarkable as having formed the starting-point for many other surges of a similar character, than for its own sake. The principle of the telephone may be briefly described as the utilization of the property of certain electrical conductors of variation in conductivity in direct proportion to any pressure applied to them from without. This curious faculty having been made serviceable first in the telephone, then in the microphone, phonograph, and their various developments, it was only natural that allied properties of other substances should be investigated by the aid of the lessons taught by the action of these instruments. Selenium has long been known to have its electrical conductivity increased by exposure to light, resuming its normal conducting power when the light is removed. Professor Graham Bell, whose name is well known in connection with the telephone, has for two or three years past been engaged in experimental research into this peculiar quality of selenium, with the avowed object of making a beam of light talk by its aid, and at a recent meeting of the American Science Association in Boston, Mr. Bell read a paper describing at length his experiments in the production and reproduction of sound by light, and the invention by Mr. Sumner Tainter and himself of an instrument for the purpose. Mr. Bell had to begin by improving the normal conductivity of the selenium, which was previously too little for successful introduction into an electrical circuit of any quantity of the substance. He succeeded in constructing small "cells" of selenium, the resistance of which might be denoted as 3, while the best previously made was as 2500 in the dark. On exposure to light the resistance of the cell was diminished about half. By these cells, when suitably connected, the fall of light—the blow struck by a ray—was rendered distinctly audible. The next step was to make the intensity of the light undulate in accordance with the vibrations of the human voice, and the consequence was that the undulations were found to be faithfully reproduced in the telephone. The apparatus used in order to effect this is sufficiently simple. A plane mirror of flexible material, such as silvered mica or microscopical glass, is employed to reflect the light—sunlight or a strong artificial light, concentrated upon it by a lens. The speaker's voice is directed against the back of this mirror, which is thrown into vibrations in the same way as the diaphragm of a telephone, and communicates these vibrations to the beam of light. The light reflected from the mirror is, after passing through a second lens, received at the distant station by a parabolic reflector, in the focus of which is placed a selenium cell in circuit with a local battery and

telephone. With instruments arranged as above described, Mr. Bell states that a number of trials have been made, over distances too great to permit of sounds being heard directly through the air. The greatest distance mentioned is 213 metres, or about 230 yards. Mr. Bell believes that similar results may be obtained at whatever distance a beam of light can be flashed from one observatory to another. An oil or gas light may be used to transmit audible speech in this way. It is difficult to say to what these researches of Mr. Bell may ultimately lead; one result besides the principal one in question having been the discovery that other substances than selenium are susceptible to light. He has found this property in gold, silver, platinum, iron, steel, brass, copper, zinc, lead, antimony, German silver, Jenkin's metal, Babbitt's metal, ivory, celluloid, gatta-percha, hard rubber, soft vulcanized rubber, paper, parchment, wood, mica, and silvered glass. Carbon and thin microscopic glass are insensible to light. Whether anything Mr. Bell has done in this direction will lead to the discovery of a method of measuring the intensity of a beam of light, and thus help forward the search for a positive photometer, remains to be proved.

THE BEST FORM OF LIGHTNING CONDUCTOR.

The subject of lightning conductors has attracted much attention of late. The comparatively novel question as to the influence of masses of metal and lines of gas and water tubing, in protected buildings, has been satisfactorily settled; and the advisability of connecting the earth terminals of lightning conductors to gas and water mains buried in the ground has also been debated, and proved affirmatively. The old problem as to the best form of the conductor itself—whether it is best round, flat, hollow, or solid—has been revived by Mr. W. A. Preece, in a communication read by him before the Mathematical and Physical Science Section of the British Association, at their Swansea meeting, and his experiments therein described should go far to settle the question for the future. There has been so much dispute on this subject among practical electricians, and the public have been so mystified by the rival lightning-men, that there has been much danger lest the adoption of necessary precautionary measures for the protection of buildings from lightning should be left to the direction of quacks, or neglected altogether. Mr. Preece announces as the result of his experiments with conductors of various forms, subjected to discharges of artificial lightning produced from the most powerful battery available, that change of form produced no difference whatever in the character of the discharge, and that it depended simply on mass. It therefore appears proved that discharges of electricity of high potentials obey the law of Ohm. Hence, extent of surface does not favour lightning discharges, and thus no more efficient lightning conductor can be devised than a simple cylindrical rod or a wire rope.

EXALTED ELECTRIC LIGHTING.

Experiments have recently been made in France and America to determine the practicality of lighting towns by means of lofty electric light towers, but with only partial success in either instance. At Rouen, during the *Mois* of July 13 and 14, eight powerful electric lights were placed on the spire of the Cathedral, with the intention of illuminating the town. Though the quantity of light produced was estimated at 5000 carcel lamps, the effect was practically *nil*. The spire merely appeared to have a huge lamp on it, which seemed to throw its light beyond the town rather than in the neighbourhood of the Cathedral. The experience of the Americans in the same direction was somewhat similar. On Nantasket Beach, near Boston, the Northern Electric Light Company erected three wooden towers, about 100 feet high, and mounted on each tower a circle of 12 Weston's electric lamps, each lamp being estimated at 2500-candle power. The towers were only 500 feet apart, and formed a triangle, so that the light (computed) of 90,000 candles was concentrate within a limited area. The motive of the Electric Light Company in arranging this costly experiment was to prove the feasibility of their proposal to light towns with almost noonday brilliancy from towers of similar design, numbering four to the square mile, and each mounting lights aggregating 90,000-candle power. On the occasion under notice, the current was produced by three Weston machines, using 36-horse power, and the whole of the lamps burned well and steadily throughout the evening, with only one slight flicker. The light yielded was just sufficient to enable two sets of base-ball nines to play in the centre of the triangle, but on account of the uncertain nature of the light, resembling that of a full moon, the games were poorly played, and there was very little light given beyond a circle of one-eighth of a mile radius.

WEST KENT GAS COMPANY.—The half-yearly meeting of this Company was held on the 20th inst.—the Vice-Chairman (Mr. J. Page) presiding, in the absence, through illness, of the Chairman (Mr. J. J. Stevens). The Secretary (Mr. R. P. Keys) read the notice convening the meeting and the report of the Directors, which stated that a profit of £3102 7s. 3d. had been made during the past half year, which was £249 Os. 8d. more than during the corresponding period of last year, and recommended the payment of the statutory dividend of 10 per cent. on the original shares, and 7 per cent. on the new capital, carrying forward a balance of £1425 7s. 3d. The report was adopted, and the dividends were declared. Mr. G. Anderson (director) proposed a vote of thanks to the officers of the company, remarking that Mr. Stevens, jun., their Engineer, had many difficulties to combat with and duties to perform, in the Company's relations to the different parochial authorities in their district, which did not usually fall within the province of a gas engineer. The motion was carried; and Mr. F. J. Stevens, in responding, referred to the difficulty in procuring a fair price for residuals, the West Kent Company's works at Erith being so near the Beekton Gas-Works that the price of coke was always very low. A vote of thanks was passed to the Chairman and Directors, and the meeting terminated.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

GAS APPARATUS EXHIBITIONS.

SIR,—We notice in your last issue some correspondence upon the subject of gas apparatus exhibitions, and also your editorial remarks thereon. As allusion is directly made to our firm, we trust you will allow us space to say that we know of no such association as described by your correspondent, the members of which wish "to keep all the gas apparatus exhibitions in their own hands."

We should be the last to give countenance to any combination which had for its object the restriction of fair competition. It is true that an association has been formed, but with a purpose widely differing from the above. Its sole object has been to raise the character of these exhibitions, which were fast drifting into "Cheap Jack" bazaars for the sale of odds and ends in no way connected with gas. Another and not less important object has been to put a check upon certain manufacturers whose commercial morality in the matter of piracy of designs, and the means adopted for securing awards, would scarcely bear the light of day. We will cite an instance of this, and leave it to your readers to judge whether respectable firms should quietly allow this sort of thing to go unchecked.

A certain firm (the name we withhold for obvious reasons) obtained three medals at one exhibition for cookers, which were certainly marvels of cheapness. The medals, however, being awarded, the object for which the cookers were made was answered, and orders for the stoves at the prices marked in the catalogue were refused to more cases than one. We are in a position to prove not only this, but also that it was well known to the manufacturers of exhibitors, before the stoves were sent to the exhibition, that they were priced below cost, and that orders were not to be taken for them. This same firm is now advertising that they have received a medal, when no such medal has been awarded. This is an isolated case, but we could name many others where it is necessary. Indeed, disreputable practices of this kind have become so common at gas apparatus exhibitions, that, if they cannot be checked, men of honour will be compelled to withdraw from them.

We could have wished that your editorial had been made upon a review of the two sides of the case, and not upon the *ex parte* statements of your correspondents. We are, however, sure that that were you or your readers "behind the scenes," the action of the association would be endorsed by all who have any desire for the maintenance of commercial morality.

Birmingham, Sept. 25, 1880.

JOHN WRIGHT AND CO.

[This letter is as vague as Messrs. Beverley and Wyld's was explicit. That communication made a definite statement, citing time and place, which Messrs. Wright and Co. do not notice. They admit that an "association" of gas stove makers exists, but assert that its objects are different to that described by our earlier correspondents. We may mention that we have received confirmation of Messrs. Beverley and Wyld's statements, since publishing their letter. But granting that the "association" was originally formed with good intentions, which have since, perhaps, become corrupted, we cannot admit that exhibitors are the proper party to assume the direction of exhibitions by which they hope to benefit in awards or business. At least, if the manufacturers themselves are to conduct the exhibitions which they patronize, the fact should be advertised, in order that the public may form their own opinion on such an arrangement. But, upon the whole, we think the promoters of exhibitions should retain the management of them, and we therefore repeat our warning contained in last week's "Circular."—Ed. J. G. L.]

Legal Intelligence.

LIVERPOOL BOROUGH SESSIONS.—WEDNESDAY, SEPT. 22.

(Before Mr. J. B. ASPENALL, Q.C., Recorder.)

THE APPOINTMENT OF A PUBLIC ACCOUNTANT OF THE LIVERPOOL CORPORATION WATER ACCOUNTS.

IT MAY be remembered that at the last April sessions (see JOURNAL, Vol. XXXV., p. 517) an application was made to the Recorder for the appointment of a competent Accountant to examine the Liverpool Corporation water accounts, pursuant to the Act 10 & 11 Vict., cap. 261, sec. 127. The application was acceded to, and Mr. McQuie appointed. His report has since been received, and to-day the matter was mentioned.

Mr. SEGAR said it was very desirable in the interests of those persons on behalf of whom he appeared, that the matter should be investigated at once, because the water-rate had already been laid for 1880; and though the Recorder might see fit to reduce the rate for this year, the sooner it was done the better, because many persons were in the unfortunate position of having already paid their rates.

The Recorder: Why do you say "unfortunate"? Mr. SEGAR replied that he said so because some of those who had paid might be entitled to pay a less sum. The applicants in those cases were always in a very great difficulty, because the accounts were not filed with the Recorder till after the rate was laid, and therefore those persons who were unable to pay the application in time to have the rate reduced before it was laid. How the ratepayers who had already paid their rates would recover, he did not know, and for the existing year he believed the mischief was already done. He understood that Mr. McConnell, who appeared for the Corporation, was anxious for an adjournment, because the Corporation had only mastered the report, and as he (Mr. Segar) understood could not master their own accounts. As his clients had gone to the trouble and expense of the inquiry, he hoped the Recorder would only postpone the question on the Corporation paying all the costs incurred in preparing to lay the whole account before him, at the present sessions. An adjournment was accordingly made, on condition that it would not prejudice the right to have the rates reduced.

Mr. McCONNELL, who appeared for the Corporation, said they had not had a full copy of the accounts, and were not ready to go on. An application had been made to examine the accounts by Mr. Pierce, and the Town Clerk replied asking him to consent to an adjournment of the application till the November session. He (Mr. McConnell) did not know that an order made could affect the rate already passed.

The Recorder said this was a matter upon which he would not express any opinion at present. Mr. Segar had spoken about people getting their

rates back again, and he thought anything of this kind ought not to be prejudiced. It was only reasonable, too, that the Corporation should pay the costs occasioned by an adjournment.
This condition was ultimately assented to.

BERKSHIRE PETTY SESSIONS.—SATURDAY, SEPT. 25.
(Before Captain BULKLEY, Chairman, and a Bench of Magistrates.)
THE DRAINAGE OF WINDSOR.

At the Windsor Town Hall, this day, the Corporation of Windsor, acting as the Urban Sanitary Authority, were charged by the Thames Conservancy with polluting the river by causing or suffering offensive and injurious matter to flow into the stream near the sewage works at Old Windsor, on the 14th of June last.

Mr. G. PAYNE represented the Thames Conservancy; and Mr. W. D. GREENE appeared for the Windsor Urban Sanitary Authority.

Mr. PAYNE observed that the proceedings were instituted in accordance with the provisions of the 29 & 30 Vict., cap. 89, secs. 64 and 65, which set forth that when any sewage or any other offensive or injurious matter was caused to flow into the Thames, the Conservators were required to give notice in writing to the person or body so offending to stop the nuisance within not less than twelve months or more than three years, and that persons or bodies failing to discontinue the pollution after such notice were liable, upon conviction, to a penalty not exceeding £100, and a further penalty not exceeding £50 a day for every day during which the offence was continued.

The facts of the case, as shown by the evidence, were as follows:—Mr. Mayo, Assistant Engineer to the Conservators, went to the Windsor Sewage Works on the 14th of June last and took a sample of the effluent water, which was said by the Analytical Chemist of the Conservators to be weak sewage, which had been mixed with a larger proportion than usual of water, and did not show any indication of having been treated by any precipitation process, and was so offensive to the sense of smell as to be dangerous to life. He would not say that it would be dangerous three miles down the river, or even at 100 yards, but this would depend upon the nature of the outfall. It was admitted that there had been previous and subsequent analyses without anything amiss being discovered.

At the conclusion of the case for the prosecution, Mr. GREENE objected, first, that there was no evidence that the prosecution was authorized by the Thames Conservators; and, secondly, that the notice which the Conservators had served upon the Board, as required by the clause under which the proceedings were taken, and which was now relied upon, was given in 1887, before the present works were in existence, and related to an entirely different state of things. The Magistrates, he said, decided the first point against the Board, and the second in their favour. The prosecution then chose to proceed under another clause, which imposed a penalty only where the act was committed without lawful excuse. He then entered upon the defence on the general merits. He said the Sanitary Authority had made a bold attempt to carry out the requirements of the Conservators, and had incurred an expense of over £40,000 in doing so. They had adopted the system of Professor Hill, which was the most approved system of the present day, and they had every reason to believe that the Thames Conservators were satisfied with the work, and for some time made no complaint. He explained that the sample was taken in a very careless and unsatisfactory manner, and that the officials of the Conservancy had taken it without communicating with the officers of the Board. The Board were, therefore, unable to satisfy themselves that the sample was fairly taken, to have an independent analysis made at the same time. He suggested that the liquid which had been subjected to analysis was stagnant water from the Thames, which was indicated by the presence of quartz, which would not be found in the sewage, and remarked that certain works were in progress at the dam, which were being carried out at the expense of the Local Government Board, and which were just being completed. Those works were the construction of additional filter-beds; and while these were in progress the escape of a small quantity of sewage might have taken place. If so, he submitted that, as the Board were acting upon the requisition of the Local Government Board, they had sufficient lawful excuse.

Mr. Davison, the Borough Surveyor, and Mr. Sainty, the Resident Engineer, were examined, and proved that on the day in question the quantity of chemicals used for purifying the sewage was in excess of what was required, and that everything was done that was possible to prevent the escape of inferior water into the river.

The CHAIRMAN said the Bench found that offensive matter had been permitted to flow out of the pipe into the river. It would have been more satisfactory if the sample had been taken with more care, and if the officers of the Thames Conservancy had gone to the works with some view of the Corporation. The Magistrates would fine the Corporation 65.

Mr. PAYNE asked for costs, which he said would be about ten guineas. Eventually the Bench allowed five guineas for the purpose.

MISCELLANEOUS NEWS.

METROPOLIS WATER SUPPLY.

Lieut. Col. Bolton's report on his examination of the water supplied by the Metropolitan Water Board during the last month is that the state of the water in the Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated) was bad from the 1st to the 3rd of August, when it became good, and continued in that condition for the remainder of the month. The highest flood state of the river at West Molesey during the month was 1 ft. 3 in. above summer level, and the lowest 2 inches below the summer level, the rainfall being 0·84 inch. The water in the River Lea was good during the greater part of the month. [These remarks refer to the condition of the water previous to filtration.] Notwithstanding the high water in the Thames, the water was in a better condition during the month of August than in July, the water supplied was slightly coloured and tanned by organic matter, principally arising from vegetation brought down by the flood waters in the early part of the month. Generally, however, the water was efficiently filtered, although the filtration did not free the water from the effects of the organic matter above referred to.

HARROW DISTRICT GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held at the Guildhall Tavern, Gresham Street, E.C., on Wednesday last—JAMES GLAZIER, Esq., in the Chair.

The ENGINEER and SECRETARY (Mr. H. C. Chapman, A. Inst. C.E.) having read the advertisement convening the meeting, the following report and accounts were presented:—

The Directors have pleasure in submitting to the Proprietors the accounts for the half-year ending June 30, 1890, and the following summary of the same:

The price of gas has been reduced 3d. per 1000 cubic feet from the 1st of July—viz., in the Harrow town district to 5s. 9d., and in the outlying districts to 6s. The balance of the profit and loss account is £11,250 10s. 6d. The Directors recommend that a dividend at the rate of 6 per cent. per annum (free of income-tax) be paid, and that £150 be written off the parliamentary expenses, leaving a balance of £12 2s. 3d. to be carried forward to the next account.

The total assets of the Company are £56,250—viz., £30,000 entitled to 10 per cent., £15,000 of 7 per cent. shares, and £11,250 of loans. The whole of the 10 per cent. shares are paid up, and £7,500 of the loans; while there still remains £12,500 of the 7 per cent. capital to be issued. The expenditure on capital during the half-year was £15 8s. 6d., making a total to date of account of £28,625 11s. 10d.

Dr. Revenue Account, for the Half Year ended June 30, 1890.		Cr.	
Manufacture of gas—		Sale of gas—	
Costs, including all expenses	£953 14 1	Lady-day quarter:	
Purifying materials, water, oil, &c.	34 10 5	Private rental—	
Salary of Engineer	125 0 0	5,631,900 cubic feet at 6s.	£15,099 11 0
Wages	211 6 3	781,600 cubic feet at 6s. 3d.	244 5 3
Works, machines, and apparatus— maintenance of repairs, and labour	174 2 4	Public rental & under contracts	151 12 6
Distribution of gas—			£1905 9 9
Mains and service-pipes, repairs, maintenance, renewal, and labour	51 2 0	Midsummer quarter:	
Meters, renewing, repairing, and refilling	11 11 5	Private rental—	
Public lamps—		2,467,000 cubic feet at 6s.	£7,222 19 5
Lighting	33 10 0	345,500 cubic feet at 6s. 3d.	100 4 7
Rents, rates, and taxes—		Public rental & under contracts	76 12 0
Rents	10 14 0		908 16 0
Rates and taxes	101 5 0	Meter-rental, the half year	78 18 6
Management—			
Directors and Auditors' allowances.	150 0 0	Residual products—	£2895 4 3
Salary of Secretary	25 0 0	Coke, less labour and cartage	306 3 7
" " " "	30 0 0	Tar, " "	74 14 5
Stationery and printing	22 5 0	Sulphate of ammonia	81 6 9
General establishment charges	76 14 5		
Sundries	4 15 8		
Bad debts	4 15 8		
Total expenditure	£2045 10 10		
Balance carried to profit and loss account	1310 2 0		
	£3355 11 0		£3355 11 0

The CHAIRMAN, in moving the adoption of the report, said the balance-sheet had doubtless attracted the Shareholders' attention. They saw the state in which their business was, and they would notice that it was merely anj in the old chain, exhibiting stagnation to a large extent—holding their own, but doing very little more than this. They would remember that the first, second, or third time he addressed them he said there did not seem much "go" in the town of Harrow, and from that day to the present it appeared to have been in a stagnant condition. They could also remember that on different occasions he had spoken of the possibility of a railway coming to Harrow, as such a thing was whispered about. Then he spoke a little more confidently on the matter—that it was really determined upon—and then he became almost afraid to speak about it. It was now, however, his great pleasure to state that the railway was an established fact. From the beginning of August the line had been open, and a most admirable service had been run—a half-hourly service—and this had been continued ever since. He had been down to Harrow several times by it, and he felt quite confident that it must give a stimulus where one so greatly needed, and every interest would be benefited by its opening. It had been found that many inquiries had been made for houses up to £50 rental—more in the past month than for several years previously. They knew that if a demand for gas came it could be supplied, and he looked forward with confidence to their having to speak of Harrow, not as a stagnant place, but as one showing vigour; and if they would be enabled to make less than 6s. per 1000 cubic feet, and should there be a large demand they would be enabled to supply it at the price which he should like to see them able to charge for it. They had already given notice of a reduction, and had thus broken through the 6s. He remarked that when he was under examination by the House of Commons Committee in connection with the Company's Bill, it was said that the Company would never break through their 6s. charge till they paid 10 per cent. dividend. He told the Committee that they would, as soon as they earned 6 per cent., and this promise had now been redeemed. He hoped and trusted that if, as he had no doubt, they obtained a dividend at a lower rate, they would be enabled, before many months to announce still further reduction in the price of gas; for he knew by experience that where they could see their way safely, every reduction was followed by a larger consumption, and that companies usually did not feel any ill effect from such reduction. This would be the spirit in which they would act, and he would maintain their 6 per cent. dividend, and still the illuminating power of the gas, for he could assure the Shareholders that from the reports given to him, and also from all he knew, the gas the Company supplied was of very high illuminating power, and also of fair purity. He did not mean to say that the sulphur in it was under 20 grains per 100 feet, but it was considerably less than 40. Their efforts had been directed to supplying a pure article, and something that would give satisfaction to every one who used it. There had been difficulties in connection with their district. There was a large firm who used to employ some 300 men, burning gas day and night, and now they employed only a few very, and he was anxious to see them enabled, before long, to stop the consumption of gas by the firm used to be fairly large, but, of course, it had fallen considerably. Still, this was one of those difficulties which a small concern like the Harrow Gas Company had to contend with; but the opening of the railway would overshadow these and other troubles, and he had every reason to believe that the Company would prosper in a very satisfactory manner.

The DEPUTY-CHAIRMAN (Mr. John Chapman), in seconding the motion, said he quite agreed with the Chairman that the prospect before the Company was encouraging, as the railway was now an accomplished fact, and he had heard that there were inquiries for houses, and that there was in the vicinity of the station which had stood empty for years had been taken up. There were now hardly any unoccupied houses in the neighbourhood, and the price of land had risen from £250, £300, or £400, to nearly £800 per acre. It therefore seemed to him that they were threatened with a building innovation, which they would encourage as they could as Directors of a Gas Company. They rejoiced at every increase in

had a population of about 50,000; and it contained some 100,000 people. Mr. T. Hawley. The works, though ample for the town at that time, sent to Leicester 1,600,000 gallons of water per day, but they were now sending about 3 million gallons daily. They all remembered the wonderfully dry season of 1866, when the rainfall, which was usually in that district 27 inches per year, fell to 10 inches. The waterworks were then in a very bad way, the water famine, many of the wells having been closed; but the Water-Works Company determined to push forward, and those works were projected and proceeded with, after which an abundant supply was secured. They were very much indebted to the gentlemen who established those works, and they were very much indebted to the Corporation for the town against the Corporation having anything to do with the works. The Corporation found it necessary, however, to assist the Company by taking a certain number of shares, and they turned out to be a good investment, but now the Council had the whole works in their own hands, and he thought they would be able to do better. He remembered reading in one of the local papers, when they were trying to take over the works, some remarks to the effect that it would be an injudicious course to pursue, inasmuch as the Company sent to Leicester 40 gallons of water per head per day; but the consumption had been reduced to 10 gallons per head per day, and the Midland Railway Company took from 3 to 3 gallons per day per head of the population for their own consumption, he thought it would show that the consumption was small in Leicester, as compared with other towns in the kingdom where the water-works were in the hands of corporations. He thought that the Corporation would be able to do better. In this extent, and the magnificent reservoir at Bradgate was 130 acres in extent, so that the two would be sufficient to supply the town of Leicester for some time to come. The revenue of the undertaking was steadily but surely increasing. For the half year ending June, 1879, the receipts were £10,000, and the expenditure was £8,000, and the balance was £2,000. He believed the receipts had been £14,894. The demand for

water was increasing very rapidly indeed, owing to the large increase in the populations of neighbouring villages which required to be supplied with water by the Corporation. He hoped they would be able to supply this demand, and that it would prove to be an advantage to the borough as a whole. As regards the profits from the works since they came into their possession, the first balance-sheet showed that they could pay £4 10s. per cent. on the capital expended, and he believed the second would, when prepared, show that they could pay 5 per cent., so that they would have a handsome balance to place to the account of the borough fund. He did not look upon the purchase of the works from a mere money point of view, but from a sanitary point of view. They were told by their Medical Officer of Health, Dr. Johnstone, that the more the people used the water-works water, and abolished the wells, the more the town had improved in health, and as a result the cases of death from fever had diminished one-half during the last five years. He hoped the works would be as successful in the future as they had been prosperous in the past.

Alderman PAKES also responded, and spoke in eulogistic terms of the Consulting Engineer of the Corporation.

Mr. C. HAWKLEY, in reply, apologized for his father's absence. Both his father and himself, he said, took a great interest in the water supply of Leicester, and it was something to be satisfied with when they knew that since the works had been established the town had never been without a constant supply. The original capital of the Water Company was £80,000, but the Bradgate works cost £120,000. So desirous, however, was the Corporation to establish the works from a money point of view, and so satisfied were they that the locality would provide that supply, that the first meeting of the Directors, at which it was decided to embark in the undertaking at Bradgate, only lasted 20 minutes. They knew that it was the best that could be done for the town. The Act of Parliament, upon which the Company to establish the works, was obtained in 1866, and in constructing them care had been taken not to deteriorate the beautiful scenery of the district, which everybody desired should not be interfered with, especially in the neighbourhood of a town like Leicester. Directions were given that the works should be made to resemble as much as possible the surrounding country, and were tastefully laid out and the buildings erected in the most stylish of architecture, in which style old Bradgate House was built. It was satisfactory to know that the Corporation had determined to maintain the place as it was. They had found it necessary, as the late Company would have done had it been in existence, to increase the area of the filter-bed, and they were also looking to the future in mind that in all probability at no very distant date Leicester would require still further works, and also bearing in mind that it took five or six years to get an Act of Parliament and construct the works authorized by it. All these things were being borne in mind by the Committees having charge of this department. As to the question of the waste of water, it was a subject which had been reduced; but he thought there was room for further improvement in this respect. It was a mistake to keep taps running to cleanse drains, because a gallon of water sent down with a rush would do more good than a day's dribbling. Besides, by wasting the water they put additional pressure on their sewage works, so that the waste was actually at both ends.

Other toasts followed, and the proceedings terminated.

EDINBURGH AND DISTRICT WATER SUPPLY.

At the Meeting of the Edinburgh and District Water Trust on Tuesday last—Lord Provost BORN in the chair.

The Chairman presented the estimates of the income and expenditure for the year ended Whit Sunday last, and the estimated receipts and expenditure of the Trust from May 15, 1880, to May 15, 1881. The income was estimated as follows:—Meter supply, £9592 10s.; shipping, £550; lime, £1500; special and miscellaneous, £7000; arrears of water-rate, £350; interest in towns and country, £250; pipe-jointing and miscellaneous receipts, £925—total, £19,449 10s. The following was the estimated expenditure:—Salaries, £2278 15s.; wages, £2974 14s. 3d.; repairs, £2824 18s. 1d.; feu duties, £448 1s. 6d.; rents, £421 6s. 3d.; taxes, £4897; printing, £118 18s. 6d.; stationery, £70; advertising, £75; interest, £2688; annual dues, £149 19s.; and sundries, £420—total, £16,115 10s. 6d. Miscellaneous expenses, £708 6s. 8d.; law expenses, £389 14s. 6d.; sinking-fund, £671; expenses of transfer and new loans, £578 10s. 6d.; Act of Parliament, £680, £581 6s. 10d.—total, £23,136 6s. 1d.; leaving £2,656 16s. 1d. to be raised from the rates. The assessments the Finance Committee recommended were:—on houses above £5 and under £10, 4s.; on houses above £10 and not exceeding £10, 9d.; on the pound, 1d.; on houses above £10, 9d. in the pound, payable by occupiers; on shops, 2d. in the pound; public water-rate, 1d. in the pound. This would give a total of £46,218 1s. 1d., which, added to the £19,449 10s. as above, makes a grand total of £75,668 1s. 1d. Deducting from this estimated total 14 per cent. for irrecoverable, £10,602 5s. 1d., leaves a net total of £75,676, to which must be added the surplus over expenditure of previous year, £41 6s. 2d., making the total estimated receipts £72,617 6s. 2d. The estimates were agreed to.

THE WATER SUPPLY OF CUCKFIELD.

A Public Meeting of the Ratepayers of the Cuckfield Local Board District was held on Tuesday evening, the 26th inst., at the Town Hall, in the chair—the question of establishing water-works for the district.

The CHAIRMAN opened the proceedings by stating that the meeting had been called in consequence of the present insufficient supply of water in the town, and of the demand for water in the neighbourhood generally. Mr. T. W. BAKER, Mayor of the Board, said that he was very desirous of establishing water-works there, and he thought that the Cuckfield Board would join them in the scheme, and so make it less expensive, as well as for the mutual benefit of both parishes.

Mr. C. O. BLANCK gave an estimate of the cost of the scheme. Supposing the scheme were adopted, he said, and the water were obtained, as it was proposed, from Westmoreland, the cost of land, wells, service reservoirs, pumps, machinery, &c., in duplicate, would, it was estimated, cost £1510; a 10-inch main from Westmoreland to Hayward's Heath, £9800; distributing-main for Hayward's Heath, £1740; ditto, Cuckfield, £1850; parliamentary charges, &c., £110; and other miscellaneous matters, which would bring the total cost to £20,000. The population of Hayward's Heath was estimated at 2200, and of Cuckfield 1570; the rateable value of each district, according to the last rate, was—Hayward's Heath, £7715; Cuckfield (including the new district), £6500. Assuming that the £20,000 could be borrowed from Government at 3½ per cent., repayable by 40 annual instalments, each instalment would be £936 5s. 2d. To this would have to be added the working expenses, making with the annual instalment a yearly expenditure of £1486 9s. 2d. The water-rents would form a deduction from this sum, and taking them at 1s. 3d. in the pound upon the rental value of the houses in the district, and assuming that only one-third of the houses would take the water, the annual revenue derivable from this source would be about £300. To this would be added extra charges for baths, gardens, stables, inns, hotels, breweries, &c., making perhaps an additional £250. Then £50 might be added for the workhouse; £200 for

the county asylum; and £30 for the railway station, making a total of £830, leaving a balance of about £600 to be borne by the ratepayers of the combined districts. Hayward's Heath would have to pay about three-fifths of this sum—namely, about £390—and Cuckfield the remaining £240, representing an additional rate of 1s. 3d. in the pound for Hayward's Heath, and 10d. in the pound for Cuckfield. This, however, would probably decrease, not only by the increase of value arising from additional buildings, but by the increased number of persons who would take the water, so that it was probable that within a few years the water-works, after having been an expense to the ratepayers, would, in fact, become a source of profit and diminish the local rates, as at Brighton, where they had saved £4000.

Mr. R. COATER disapproved of the scheme, and said the water supply was quite adequate for the district. He should like to know if they could put a stop to every case of ratepayers who had complained of a want of water. The greater proportion of the people had a superabundance of water, and there was no necessity for water-works. With regard to the quality of the water he was perfectly satisfied with it, and if the Local Board were going to force this scheme upon the ratepayers it was a perfect mockery to call the meeting.

Dr. BYASS strongly denied the imputation that the Local Board wished to force the scheme upon the inhabitants, and the very fact of the Board having called a meeting in order that the ratepayers might express their opinion ought to satisfy everybody upon that point. The meeting was called to obtain an opinion from the ratepayers generally, and if they decided not to have the water-works, that decision would be upheld by the Board.

Mr. W. COMBER strongly deprecated the proposal, and said he hoped every ratepayer would oppose the scheme.

Dr. BYASS moved, and Mr. BEST seconded, that the meeting be adjourned *sine die*.

Mr. W. COMBER took objection to this. The meeting had been called for a certain purpose, and he thought it no more than right that they should express an opinion now they were there. He therefore moved as amended, that the meeting be not adjourned.

Mr. F. HOUNSILL seconded the amendment, which, on being put to the meeting, was carried with a dissentient voice.

Mr. COMBER then proposed—"That this meeting do not see any necessity for the proposed scheme for water-works."

Mr. COATES seconded the proposition, which was carried unanimously, and the meeting closed with a vote of thanks to the Chairman for presiding.

SANITARY INSTITUTE OF GREAT BRITAIN.

ANNUAL CONGRESS IN EXETER.

The Fourth Annual Congress of the Sanitary Institute of Great Britain was opened at the Victoria Hall, Exeter, on Tuesday last, under the presidency of Earl FORTESCUE.

Previous to the opening of the Congress, the President and the principal members, including a numerous company, were entertained at a reception at the Victoria Hall by Mr. W. H. Ellis, who presided, and the Reception Committee of the Corporation.

The usual preliminary toasts having been honoured, THE SHERIFF (Mr. S. Jones) proposed "The Houses of Parliament," coupling with the toasts the names of Earl Fortescue and Mr. H. S. Northcote, M.P., who each responded.

Other toasts followed, among which was "Welcome to the Meeting of the Sanitary Institute in Exeter," (to which Dr. B. W. RICHARDSON, F.R.S., responded; and the proceedings closed with a vote of thanks to the Mayor.

A procession was then formed, and the company proceeded to the opening of the exhibition of sanitary and other appliances, held in connection with the Congress, at the Victoria Hall.

The President declared it duly opened to the public, and in doing so said he felt sure they would all gain some valuable information from an inspection of the exhibits brought together. It was the first exhibition of the kind ever held in Exeter, and among the best ever held anywhere. They had here brought together perhaps the best collections of gas-cooking apparatus ever shown, thanks in a great measure to the liberality of the Exeter Gas Company, who had offered to give medals for the apparatus adjudged to be the best suited for the purposes. There were, he was informed, upwards of one hundred exhibits entered in this department, and he trusted one or two of them would be so constructed as to encourage a new mode of cooking. Our ordinary fires were very wasteful, and he supposed we used three or four times as much fuel as we ought. As the President had observed to him, the use of gas for cooking would also tend to lessen the black smoke which was so much waste of fuel, seeing it might be converted into gas. The present building was conceived to be suited for such an exhibition, seeing that it was the site of the old gas-works. In conclusion, his Worship expressed a hope that the present meeting of the Congress and this exhibition would result in rendering Exeter and the neighbourhood one of the healthiest places in the world.

On Tuesday evening the first general meeting was held at the Victoria Hall. Dr. B. W. RICHARDSON occupied the chair, but after a few brief remarks he handed the chair to Mr. E. J. HARRIS.

Earl FORTESCUE, who proceeded to deliver his Inaugural Address, in the course of which he remarked that his connection with the great sanitary cause dated from the year 1845, when he selected the subject of the health of towns for a lecture to his constituents at Plymouth, and he had remained since that time an ardent student of the subject. He looked back at those days, he must allow that, relying on the soundness of their views and the accumulated evidence on which they were based, the early sanitary reformers somewhat underrated the strength of the opposition they had to encounter. Ignorance, prejudice, vain arm, and rude ignorance were raised against them, and they were not only without support, but only the men of the wage class, for whose benefit, as the greatest sufferers from the then general violation of the plainest laws of hygiene, the efforts made for their enforcement were more especially directed, but comprising also too many who ought to have known better. He then gave the history of various sanitary movements with which he had been connected up to the year 1869, when the Royal Sanitary Commission of Inquiry was appointed, and, after taking much evidence, made most valuable reports, upon the practical recommendation in which, and especially upon the most important of them, subsequent sanitary legislation was raised. He then unfortunately died, and the cause was left, based on that recommendation being that there should be one Local Authority for all public health purposes in every place, so that no local area should be without such an one, or have more than one. In 1871 the Local Government Board, as it stated, the Sanitary and the Poor Law Board under the Poor Law Acts, of the Secretary of State under the Registration Acts, the various Sanitary Acts, and the Local Taxation Return Act, and of the Privy Council under the Prevention of Diseases and the Vaccination Acts, were transferred to the new Board thus created;

THE TEMPERATURE OF TOWN WATER SUPPLIES.

By MR. BALDWIN LATHAM, C.E., M.Inst. C.E., F.G.S., &c.
[A Paper read before the Mechanical Science Section of the British Association at Swansea.]

In a paper read last year before this Association,* the Author gave the results of a series of experiments, extending over a considerable period, on the temperature of town water supplies, and referred to the influence of the temperature of town water upon public health.

In the communication referred to, it was shown that the temperature of water, as delivered through the water-mains to the house of the consumer, was totally independent of the temperature of the water at its source, and that the temperature of the water supply was governed, to a great extent, at all periods of the year, by the temperature of the ground, at the depth at which the water-mains were laid. It was further pointed out that the influence of temperature of water supply had a very marked effect upon certain classes of disease, especially diarrhoea and cholera, and that it was not until the temperature of the water reached about 62° that these diseases became epidemic in a district.

In order that it may be shown that it is not the effect of increase in atmospheric temperature that is instrumental in propagating diarrhoea and cholera, but that both these diseases are governed by the changes which take place in water when its temperature is increased, it may be pointed out that, in districts in which the source of water supply is not liable to increase of temperature by reason of the arrangements adopted for its distribution, summer diarrhoea does not become epidemic. For example, we may refer to the district of Croydon, in Surrey, in the years 1877 and 1879 (especially the latter year) were years in which town water did not reach its most dangerous temperature, but in 1878 the town water supplies arrived at a high and dangerous degree of temperature.

The water distributed under the system of constant supply at the Author's house in Croydon, which is situated at a low level, was, in 1878, a maximum of 64°; and, in Westminster, the water supplied by the Chelsea Water Company reached a temperature of 69°; while water taken from a cistern in Croydon had a maximum temperature, in the same year, of 71°; in 1879, the highest temperature of the water in the cistern at Croydon was 67°; and in Westminster, the highest temperature of the water, as delivered from the mains in Croydon, in 1877, was 61°; and, in 1879, 60°; whilst, in Westminster, the highest temperature of the water, in 1879, was 64°. The deaths from diarrhoea in Croydon in the three years, 1877-9, were as follows:—1877, 0.48 per 1000 living in the district; 1878, 1.04 per 1000 living in the district; 1879, 0.4 per 1000 living in the district. In London the deaths from diarrhoea were: 1877, 0.70 per 1000 living in the district; 1878, 1.02 per 1000 living in the district; 1879, 0.62 per 1000 living in the district.

If these death-rates are compared with the death-rates of districts in which the water is principally taken direct from wells, it will be seen that in these latter districts the death-rates are low, as, for example, in the districts of Mitcham and Merton, which are partly supplied with water from artesian wells (of an uniform temperature of about 64°), partly by surface wells, and partly by the Lambeth Water Company. These two districts have a population at the present time of about 120,000 persons. In 1877 the death-rate from diarrhoea was 0.39 per 1000; in 1878, 0.47 per 1000; and in 1879, 0.46 per 1000. In Beddington, which is also principally supplied from local wells, in 1877 the death-rate from diarrhoea was 0.20 per 1000; in 1878, 0.49 per 1000; and in 1879 there were no deaths whatever from diarrhoea. In the three years 1877 to 1879, in the districts of Mitcham and Merton, there were 14 deaths from diarrhoea recorded, of which 10 occurred in roads supplied with water by the Lambeth Water Company, and 4 in roads supplied with water from shallow and artesian wells.

In order to further show that the temperature of water has an influence on health, the Author placed upon a map the whole of the deaths from diarrhoea which have occurred in Croydon during the 11 years 1869 to 1879 inclusive. The water supply of Croydon is taken from wells, the range in the temperature of the water of which has not exceeded 115°; its highest recently observed temperature being 51°; on the 19th of June, 1880, and the lowest temperature at an earlier period being 42° on the 18th of June, 1878. The water, after leaving the wells at Croydon Water-Works, is pumped to a summit reservoir, from which it is distributed to the town. In order to raise the temperature of the water, it is necessary for it to flow a certain distance through the distributing mains before its temperature becomes raised. It is a significant fact that in the districts within 1 mile of the reservoir in which the water is always at its highest temperature, in summer, during the whole period of 11 years not a single death from diarrhoea has taken place in the neighbourhood of the leading mains, but the distribution of the deaths occurs in the most remote and lowest portions of the district, or those which are naturally subject to the greatest changes in the range of temperature of the water supply.

The incidence of the deaths from diarrhoea in London and the neighbourhood also shows that this disease is mainly due to the increase in the temperature of water supply, and not to atmospheric temperature, as in all those districts supplied from the River Thames the water naturally gets to its highest temperature at an earlier period than in the River districts supplied from wells, as in the Kent Water Company's district, where the temperature of the water at its source is pretty uniform throughout the year, and in which the water is naturally colder in summer, at the distance through the mains, than is the case with the river water. An examination of the mortality from diarrhoea in the River Thames district, and the general mortality from diarrhoea in districts supplied by the Kent Water Company and the river water companies is practically identical, the disease always first manifests itself in the districts taking water from the Thames. For example, in 1878, diarrhoea may be said to have been epidemic in Lambeth, where the water is supplied from the River Thames, and got to its highest pitch in the week ending July 27, whereas in Greenwich (supplied with the Kent water) this disease did not become epidemic until the week ending July 17, and got to its highest pitch in the week ending Aug. 9, showing the incidence of this disease to be later in the Kent Water Company's district than in the district supplied from the River Thames, the reason being that, as the water of the Kent Company is colder at its source than the Thames water, naturally it requires the ground to be raised to a higher temperature before the water reaches a dangerous point, and therefore, the incidence of the disease falls later in the Kent district than in the district supplied from the River Thames. The development of the disease, in these districts, is also conformable to water being the cause, and not general atmospheric increase in temperature, for if the cause were due to atmospheric influences, which are general, the incidence of the disease should have fallen at the same period in each district, but as the incidence is strictly conformable to the temperature of the respective water supplies, and does not conform with atmospheric causes, the inference to be drawn is that summer diarrhoea is governed by the influence of the temperature of our water supplies, as invariably the disease becomes epidemic when the water, whatever be its source of supply, reaches a temperature of about 62°.

Having now shown that water may be affected for good or evil by reason

of its temperature, and having also shown in a former paper that the earth has enormous powers of influencing the temperature of water supplies, the Author desires to point out a mode by which the temperature of the earth may be made use of, in order to give water a nearly uniform temperature throughout the year, which, if brought into general operation, the Author believes, will remove the cause of those conditions of town water supplies, arising from an increase of temperature in the summer time, and also, possibly, from the extreme coldness of the water in winter periods, which affect public health.

The great changes of temperature in the earth occur within a few feet of the surface. The greatest range of temperature occurs at the surface, and as we pass downwards from the surface to a depth of from 30 to 85 feet, the temperature becomes nearly uniform throughout the year, and at the point of uniform temperature, the temperature is equal to the average ground temperature at the place. The observations are made.

From a number of observations made by the Author, at a rate of varying from 6 inches to 50 feet, it is shown that, at a depth of 20 feet, the coldest temperature is experienced in the middle of May, and the warmest temperature at this depth is at the end of October. The range in temperature observed at this depth is 5° in Croydon. At 25 feet in depth the coldest period occurs at the beginning of July, and the warmest period in the winter, the range in temperature being a little over 1°. At a depth of 30 feet the coldest temperature occurs in July. If an apparatus similar to that which has been invented and patented by Professor J. T. Way and the Author is used for tempering the water, and which consists simply of a glass tube, drawn from a 3/4 inch tube, at a rate not exceeding 1 gallon every half hour. The range of temperature observed in cistern water at Croydon has been 38°; or on the 22nd of July, 1878, it was 71°; and on the 30th of January, 1880, it was 32°. The town water supply of Croydon (drawn direct from the mains), the temperature of which has been shown to be nearly uniform in the wells, when distributed by a system of constant service, was shown to be 64° on the 22nd of July, 1878, and 37°-2 on the 28th of January, 1880, giving a range of 27°.

In the tempering tube, when the conditions of water supply are at the average ground temperature, the temperature of the water modifying these dangerous conditions. The cold of winter only descends to the greater depth in the heat of summer, and the warmth of summer only descends to the greater depths in the winter time, so that the temperature of the cold water of winter is raised by the previous summer's heat, whilst the warm water of summer is cooled by the previous winter's cold temperature.

Experiments made at the Author's house in July this year show that if 10 gallons of water are drawn at any time within half an hour, the following results are obtained:—

1st Gallon.—	Temperature of water going into tube, 69°; temperature of water coming out, 50°.
2nd Gallon.—	Temperature reduced from 69° to 62°.
3rd "	" " " 62° " 51°.
4th "	" " " 60° " 52°.
5th "	" " " 60° " 53°.
6th "	" " " 60° " 54°.
7th "	" " " 60° " 55°.
8th "	" " " 60° " 55°.
9th "	" " " 60° " 56°.
10th "	" " " 61° " 57°.

These experiments have been repeated various times, and give precisely identical results. In the winter the water is raised in temperature, as, for example, on the 2nd of February, 1880, water at the source of the well had a temperature of 34°, and, coming out, had a temperature of 49°.

The advantage of the use of this apparatus consists in the fact that it is entirely self-acting, and the whole of the water supply necessary for domestic purposes may be filtered, purified, and tempered, without any greater cost than now incurred in the first cost of the apparatus and without adding anything of a deleterious character to the water, as may be the case when ice is used, which has been shown, especially in America, to be a prolific cause of disease, when collected from impure sources. Moreover, the results secured by the tube are more than equal to those attained by the most bountiful use of ice, and further, it is doubtful if, by the use of ice in water already highly impure, the sufficient improvement in the health of the mind allowed before the water is consumed is sufficient to destroy its noxious properties. In the case of the patent tube, however, a mass of water is gradually undergoing the process of tempering, in a perfectly natural way, until it arrives at a temperature which is shown by experience to be most healthful.

The Directors of the Rio de Janeiro Gas Company have decided to pay, on and after the 11th prox., an interim dividend at the rate of 10 per cent. per annum, free of income-tax, for the half year ended the 30th of June last.

BURSTING OF A WATER-MAIN AT ASTON.—About midday on Tuesday last one of the principal water-mains in connection with the Birmingham Corporation Water-Works service burst at Aston. The immediate effect of the accident was a temporary stoppage of the traffic in the locality where the main burst, and some domestic inconvenience caused by a non-supply of water for a few hours. The main burst occurred in the main, about 24 inches in diameter, and the pressure of water which was rushing through it may be gathered from the fact that the moment the burst took place the earth above was literally forced away, and a ravine 14 yards wide and 2 yards deep was formed for a considerable distance. The water rushed with uncontrolled impetuosity in streams down the road, overflowing the footway and some adjoining fields; and as it swirled round the bridge which spans the River Tame, almost swept a portion of it away. The water kept rushing from the trench, and had not prompt action been taken to check its progress, probably such a mischief would have been done. Fortunately, however, some workmen engaged at the filter-beds, not far from the spot where the main burst, and no time was lost in diverting the traffic from the Lichfield Road. No steps could be taken to shut off the water until information had been sent to the works at Whitacre and Plants Brook. Ultimately the rushing water was stopped by closing the valves, and afterwards gangs of men were engaged in getting the water out of the trench in the main road. This work occupied the men until Wednesday morning, and it was not until the afternoon of that day that the pipe was repaired. During this time the supply of water for what is called the low level district had to come from the main low level district; but there was no fear of any serious interference with the general water supply of the borough, as there are three independent sources from which water can be obtained. Mr. Gray, the principal Engineer of the water department, was at the scene of the accident, and rendered very valuable aid.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The Dumbarton Corporation Gas Commissioners have just issued a statement of their accounts for the year ending Aug. 1, 1880. Including the gas-rental of £4068 8s. 9d., the year's revenue stands at £4960 5s. 6d.; and there is shown a profit on the year's transactions amounting to £982 8s. 11d., of which the sum of £855 is applied to meet the year's deficiency of Clyde Pipe income. Up to the present time there has been an accumulated profit on the gas supply undertaking of the burgh amounting to £2349 18s. 8d.; and the sum of £1107 6s. 6d. has been expended in the purchase of the gas annuities.

At their annual general meeting, held a few days ago, the Fraserburgh Gas Company resolved to reduce the price of gas 5d. per 1000 cubic feet—from 7s. 11d. to 7s. 6d.

The second annual general meeting of the Falkirk Lighting Company, Limited, was held last Tuesday—Mr. J. McGilchrist, Chairman of the Company, presiding. Some formal business was first transacted, after which the Chairman submitted the report by the Directors, in which it was recommended that a dividend at the rate of 10 per cent. should be declared. In the course of a brief statement which he made, the Chairman mentioned that when they acquired the works for the old Company they had been in a dilapidated condition, and that the plant was in such a state as to be totally unfit to maintain a constant supply of pure gas of a high illuminating power. Now, however, things had been changed, the Company being in possession of a well-appointed gas-works. As the means of producing gas had been changed and improved, the Directors were turning their attention to the external surroundings, and he trusted that before long the works would be the scene of some improvements in the buildings and enclosures—improvements which would materially add to the external appearance of the works. Their success during the past year was greatly due to the economical management of the works, and for the future they meant to economise still further, and he trusted the recommendation of the Directors would be adopted. They were determined also still further to lower the price of gas to the consumers, and they had recommended that the price should at once be reduced another 5d. per 1000 cubic feet, the reduction to come into force from the date of last meeting. This reduction would, with those formerly made by the Company, amount to 3s. 3d. in the reduction of price, and was beginning to make itself felt in the shape of increased consumption, and that again had compelled the Directors to look about for ground on which to make extensions. Very soon they would be in a position to supply gas to a population of 30,000. The report was adopted, and the Chairman recommended a motion of thanks to the Directors.

At a special meeting of the Alva Burgh Commissioners held last Wednesday, it was unanimously agreed to adopt the Burghs Gas Supply (Scotland) Act, 1876; and it was resolved to hold another meeting on the 22nd of November, to resume consideration of the question, and take the final decision. Should there be no opposition, it was also agreed to transmit a copy of the minutes to each elector in the burgh.

The monthly meeting of the Police Board of Greenock was held last Tuesday, at which there was submitted a minute from the Law and Finance Committee, stating that they been called to consider the recommendation of the Gas Committee to hand over to the Police Board the sum of £8000 of gas profits, and to carry to the reduction of value of works £1100. The Committee, after a full discussion of the whole question, agreed that notice be given to rescind, at the next meeting of the Board, the resolution to pay over to the Board only £3000 as profits, instead of £4000, as in former years. On the motion of Mr. Campbell, it was agreed to rescind the resolution. Councillor R. Shankland carried the dissent.

For the year ending May 15, 1880, the amount expended by the Police Commissioners of the district for public lighting was £2534 2s. 21d., the cost of the gas supplied to the public lamps being £1000 10s. 10d.

Business was done last Thursday in Glasgow Corporation 9 per cent. gas annuities at £225 10s.; and on the following day Edinburgh and Leith gas shares were wanted at £35, being a rise of 50s.

Dunfries was the rule during last week in the Glasgow pig iron market, and there is still abundance in the market, and very few prices are being taken; steam coal delivered either at Liverpool or Glasgow being offered at 3s. 3d. to 6s. 6d. per ton, and good second quality of slack being offered at 2s. 6d. per ton.

Some slight improvement is now showing itself in the coal trade, and by-and-by it is probable that the activity will be further increased.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

With regard to the coal trade of this district, there is little or no change to notice. For gas coals I do not hear of any inquiries in the market, business in these being practically over for the present season. Common round demand, and continue very low in price. Engine classes of fuel remain firm as a rule, as there is not yet any largely increased quantity of slack being produced. The average quotations at the pit mouth may be given about as under—Best Lancashire, 8s. to 8s. 6d. per ton, with good quality coming at 7s. 6d.; seconds, 5s. 9d. to 5s. 3d.; common round coals, 4s. 6d. to 5d. 3d.; bulky, 3s. 6d. to 4s. 3d.; good slack, 3s. to 3s. 6d.; and common about 2s. 6d. per ton.

There has been a considerable quantity of coal going away during the past week for coastwise shipments, and with some of the foreign ports, where the season will shortly close, a fair business is also being done; but there are still abundant supplies in the market, and very few prices are being taken; steam coal delivered either at Liverpool or Glasgow being offered at 3s. 3d. to 6s. 6d. per ton, and good second quality of slack being offered at 2s. 6d. per ton.

There continues in dull demand at the prices quoted last week.

In the iron trade business for the present seems to be entirely at a standstill. Consumers are in no immediate want of iron, and as prices are week after week showing a downward tendency, they are naturally holding back any orders until it is apparent that quotations have touched their lowest point. Any orders at present being made are chiefly confined to a few odd parcels just sufficient to meet the immediate requirements, and the blast furnaces in the district are only kept going with deliveries which have still to be made on account of old contracts. Finished iron is also in less demand, and although some of the local forces are still busy, and there are a good many complaints that very few new orders are being received. For delivery at Manchester, the nominal quotations are about 49s. to 50s. per ton, less 2½d. for Lancashire pig iron, and about 46s. for bar iron; but offers for prompt delivery would be readily accepted at under these figures.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

But little difference can be reported to exist in the local coal trade in this district over that of the past few weeks. As compared, however, with the business done six months ago, there is a perceptible improvement. The chief market at the present time is the demand for iron-

making. Indeed, so much has the call for furnace coal increased, that at several collieries the district the output is double what it was at the beginning of the year. It may also be stated that the number of iron-making furnaces in full work at the present time more than doubles the number of a twelvemonth ago, there being now in blast as many as 64 furnaces in the South Staffordshire district, while at the corresponding period of 1879 only 25 were working order. This is a striking feature, and can be given of the improvement in the South Staffordshire trades. Household coals have not, as yet, been in much request in the way of autumn contracts, though there is a slight improvement in the output of the Cannock Chase district, and heavier tonnages have been loaded for transit for the South within the last week or two. Complaints, however, are made of the keenness of the competition experienced from other districts, and more particularly from the North Wales productions.

The gas coal trade is fairly good, but most of the largest contracts have been made up. Coke is in an improved state, and prices on the whole are much firmer.

The iron trade is reported to be somewhat quieter, though for a few sorts of manufactured iron there are numerous inquiries. The demand for pigs is still good, but the commoner classes are scarcely so firm. The overstocked state of the Middleborough markets have to a considerable extent affected the coal trade. Best marked bars are slow sale, but high for quality, and good qualities customers are looking for better iron, for tub-making, nail-roads, and plates, are receiving greater attention. Both girder and boiler plates are reported firmer. Sheets are, however, receiving the best call, and sellers are holding out for slight advances over the rates of a week ago. Singles are not to be had for less than 48, while a few shillings more are asked for the better qualities. Both miners and finished iron makers are looking forward to the coming quarter-day, as likely to be productive of a distribution of orders and contracts for both raw and finished iron. Heavy ironfounders are tolerably well employed, as also are tube makers, and makers of colliery appliances.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The position of the iron trade throughout the county has undergone but little change since my last notice. The works devoted to the output of manufactured iron vary a good deal. Throughout the South Yorkshire district mill and forge materials are not in over-active request, hoop iron being among the largest productions, at the Milton and Elsecroft Works. The small foundries are still in a very indifferent position, but at the Thorncliffe Works, where a large quantity of gas apparatus is usually made, workmen are well employed. The position of the Bessemer steel trade is still good, and at the Yorkshire steel and iron works the weekly output of rails and rods does not diminish. A meeting of the directors, held with regard to the output of pig iron, has not having been of late, but little change to note respecting the furnaces in blast.

The coal trade in the West Yorkshire district is very quiet, yet the men and masters are in a much more settled state than in the southern part of the coal-field. The steam coal collieries have been the best for orders, and long time, and have placed a large order with regard to the export trade of Hull and Goole; but the demand is somewhat quieter than it was.

Gas and locomotive coal are in fair request, and being for the most part supplied in connection with contracts, the sales do not vary a great deal. A meeting of the South Yorkshire Colliery Owners Association has been held since my last report, when the general aspect of the trade was considered. The Great Northern Railway contracts expire on the last day of the present month, so that some interest is being taken in their renewal by the district colliery owners, who send most of their London orders over the Company's line, and before long look for their patronage.

The coke trade is fairly active, although at some places the output has been diminished. There is, however, a large tonnage sent to North Lincolnshire and other places where smelting operations are carried on. Many of the iron owners by Earl Fitzwilliam, between Hemmelfield and Elsecroft, and it is stated that the consequence of the damage done to the vegetation on his estate it is intended to limit the output. At several other collieries in the district the lessor of the minerals and the Sanitary Authorities have caused the owners to erect large chimneys to carry off the smoke.

A deal might be written about the numerous strikes disputes, and pending reductions now going on in the South Yorkshire coal-field. The latest disputes or changes are at the Stanhope Silkstone Colliery, where the men have come out against a reduction. A demand for an alteration in the mode of working has been made at the Hoyland Silkstone Colliery, which will North the owners ask for 5 per cent. reduction from all day men, and certain concessions from the miners, the pit not paying.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

It is unnecessary to repeat that as the nights continue to lengthen the demand for gas coals is increasing. The collieries in the district are not only from the Tyne, but from the Wear and Hartlepool. There is little, if any, alteration of prices, and the large business transacted in the shipments of gas coals to most parts of the world are being done at quotations which have prevailed over the summer, and which is hardly profitable. There is nothing, after all, altering the general coal trade, and there is doing a very good shipping business, but at prices which do not yield much profit to the proprietors of the collieries. There was a stoppage of a large shipping firm at Newcastle last week extensively connected with the coke trade to the Baltic, and it has had a very bad effect upon the market. Steam coals are in demand in price, and are much inquired after.

The demand for coasting tonnage to be employed in the gas trade is stronger, and freights have had a tendency to advance. Handy ships have been scarce over the last ten days. Higher rates have been paid to sailing vessels to take gas coals to Ireland; 7s. per ton Dublin, and 7s. 9d. per ton Waterford, for gas coals, and 6s. 6d. per ton for chartering with the Eastern Counties, the Channel, and the North of France shows improved rates. A considerable amount of steam tonnage is employed carrying gas coals to London and the larger ports in the South of England at current rates of freight. Sailing tonnage has been engaged to carry coke to Spain and Africa, and the shipment of coke to the large ports as St. Petersburg and Riga are active. The outward shipping trade becomes more pressing with the rapid approach of the close of the Baltic season.

Except for very best sorts, the fire-brick trade of the Tyne, Wear, and Tees is dull. Shipments, except from two or three leading factories, are very few. A moderate business in cement is also transacted, but the chemical trade of this district does not improve, and prices can barely be maintained. There is a singular absence of continental business. The Cleveland iron trade shows no improvement. Prices have a somewhat dropping tendency. With larger supplies the price of British and foreign lead is low. There is a moderate market for copper, and the demand for timber, though not large, meet the requirements of trade, and prices are unaltered from last quotations.

MARTOCK (SOMERSET) GAS COMPANY.—As the result of a very large meeting of the inhabitants of Martock, Hinton, and Stoke-sub-Hamdon, a Gas Company has been established under the Limited Liability Companies Act, for the purpose of lighting these places with gas. The capital is £3000, in £5 shares.

ROTTHWELL GASLIGHT COMPANY, LIMITED.—This is the registration title, dated the 20th inst., of a Company originally constituted by deed of settlement on the 18th of February, 1856, and completely registered under 7 & 8 Vict., cap. 110, on the 3rd of March, 1856. The capital is £8000, in £5 shares, the whole of which are allotted to 50 Shareholders, £5 per share being paid up upon 1100 shares, and £2 upon the remaining 500.

CONFERENCE OF MUNICIPAL AND SANITARY ENGINEERS.—On Friday last the first conference of the Northern District Branch of the Association of Municipal and Sanitary Engineers and Surveyors was held at Darlington under the presidency of Mr. A. W. Morant, the Borough Engineer of Leeds. There was a numerous attendance of delegates. Papers were read on subjects connected with the disposal of sewage, by Mr. Craggs, of Shilton, and Mr. G. Bell, Surveyor to the Felling Local Board, and votes of thanks having been passed to those gentlemen, the company paid a visit to the works of the Darlington Iron Company and to the Darlington Corporation Sewage Farm. In the evening the members dined together, the President of the Association occupying the chair.

THE PRICE OF GAS AT BARNSELY.—At the monthly meeting of the Barnsley Town Council, on Tuesday last—the Mayor in the chair—Mr. Wray asked the Chairman whether anything could be done with respect to the Barnsley Gas Company and the price charged for gas to consumers. He quoted a number of statistics relating to the price of gas in Sheffield, Leeds, Doncaster, Rotherham, and Wakefield, the price being lower than at Barnsley. He thought it was time some one looked into the matter. Mr. Blackburn agreed with Mr. Wray with respect to the charges made for gas. He gave notice to move that a Committee be appointed for the purpose of making inquiries, with a view to purchasing the present works or starting new ones. The Mayor intimated that he was in favour of the establishment of other gas-works. Mr. Craik said he should be glad to supply the Council with any quantity of gas at 1s. per 1000 feet less than they were now paying, if they would lay down the pipes. The subject then dropped.

SANITARY PRIZE ESSAY.—The Government of India has just offered a prize of £100 for the best "Manual of Hygiene," to serve as a text-book for the use of the British soldiers in that country. Works submitted in competition for this prize must be sent in by their authors to the Secretary to the Government of India in the Military Department at Calcutta, so as to reach his hands not later than the last day of next March. The work is "to be written in clear and simple English, and thoroughly practical, showing the ordinary causes affecting health, and the special dangers to which British soldiers are exposed in India, more particularly during their first year in the country, and the best means by which those dangers may be averted." The work, if accepted, will be printed at the public expense, and become the property of the State, and it is not to exceed in bulk "more than 50 or 60 pages of print, of small paper, octavo size." It is added that the Government of India will not feel bound to award the prize at all, unless one at least of the manuals produced in competition shall be judged "in all respects suitable to the purposes for which it is required."

HUDDESFIELD CORPORATION WATER SUPPLY.—At the meeting of the Huddersfield Town Council on Wednesday, the 15th inst.—the Mayor (Alderman Walker) in the chair—a long discussion took place on the question of the disposal of the water-works surplus value fund. The Mayor having stated that he had received a memorial from the Huddersfield and District Teachers Association, praying the Council to take some steps with the object of establishing a free public library for the borough, Mr. W. Marriott moved—"That the fund called the water-works surplus value fund be applied to the purpose of a new technical school, and to the formation of a free library, in such proportions as the Council may deem fit," supporting his motion in a long speech. Alderman H. Hirst moved an amendment to the effect that the question of the application of the fund should be adjourned for future consideration. After a long and animated discussion, the motion was lost by a majority of 28, and the amendment consequently became the substantive motion. To this an amendment was moved as follows—"That the water-works surplus value fund be invested, and the income thereof applied to the purpose of providing a free library and a building for the same;" but on its being put to the meeting it was lost by a majority of 20. The amendment to the first motion was, therefore, carried, and the question of the application of the fund thus stands adjourned.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 3696.—MASON, S., Birmingham, "Improvements in couplings of joints for taps and pipes." Sept. 11, 1880.
3720.—HADDAN, H. J., Westminster, "Improvements in liquid meters." A communication. Sept. 13, 1880.
3730.—POPE, A., Slough, Bucks, "Improvements in the manufacture of gas and in apparatus therefor, and for lighting and heating railway carriages, and for similar purposes." Sept. 13, 1880.
3759.—KITTO, C. W., Old Broad Street, and THOMPSON, W. H., Finsbury Circus, London, "Improvements in apparatus and arrangements for lighting buildings, ships, and other places." Sept. 15, 1880.
3785.—JACKSON, W. M., Providence, U.S.A., "An improvement in machines and process for carbureting gas and air." (Complete specification.) Sept. 18, 1880.
3791.—CARTWOOD, S. and S. R., Bolton, Lancs., "Improvements in burners for and apparatus for obtaining light by the combustion of gas or inflammable vapours." Sept. 18, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

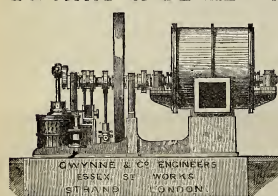
- 995.—BOUYETRE, A. de (A. E.), Paris, "Improvements in gas furnaces for melting glass." March 13, 1880.
1024.—RAMSBOOTH, J., Alderley Edge, Chester, "Improvements in the construction of apparatus for working the expansion valves of steam, air, or gas engines." March 11, 1880.
1092.—WRIGHT, F., Baker Street, London, "Improvements in gas-regulators." March 13, 1880.
1121.—HARVEY, P., Skegness, Lincoln, "Improvements in giving motion to the valves of water-meters and in apparatus or appliances therefor." March 16, 1880.
1181.—CLARK, A. M., Chancery Lane, London, "Improvements in apparatus for effecting the absorption and washing of gases and vapours." A communication. March 13, 1880.
1221.—WEST, J., Maidstone, Kent, "Improvements in apparatus for breaking coal, and for charging and discharging gas-retorts." March 23, 1880.
1238.—THOMPSON, W. P., Liverpool, "Improvements in gas heating apparatus or apparatus in which gas is burned on the Bunsen principle." A communication. March 23, 1880.
1253.—MORLEY, C. W., Regent's Park, London, "An improvement in galleries or globe holders." March 24, 1880.
1257.—QUITMAN, C., Jevin Crescent, London, "Improvements in extinguishing apparatus for lamps." A communication. March 24, 1880.
1300.—YOUNG, W. C., Poplar, London, "Improvements in the manufacture of sulphate of ammonia." March 30, 1880.
1517.—MOBAN-BROWN, W., Southampton Buildings, London, "Improvements in fluid-meters." A communication. April 15, 1880.
2964.—IMRAY, J., Chancery Lane, London, "Improvements in apparatus for distilling ammoniacal liquor." A communication. July 19, 1880.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

- 2787.—TIDCOMBE, G., "Improvements in means or apparatus for heating and ventilating greenhouses and other places by means of gas." July 21, 1877.
2945.—LAKE, W. R., "Improvements in water-meters." July 25, 1877.
3003.—TABARIQ, G., "Improvements in galleries for gas and other lamp glasses." Aug. 7, 1877.
3024.—MILLS, E. C., and HALEY, H., "Improvements in motive-power engines worked by the explosion of gas." Aug. 8, 1877.
3051.—RICHARDY, G., "Improvements in gasaliers and other pendent lights." Aug. 10, 1877.
3145.—THOMPSON, W. P., "Improvements in and appertaining to ball or spherical valves." Aug. 18, 1877.
3189.—MATTHEW, W., "Improvements in apparatus for boring and well sinking." Aug. 22, 1877.
3297.—WHELFIELD, B., "Improvements in gas checks." Aug. 30, 1877.
3311.—MARRIOTT, W., "An improved process or method of purifying gas." Aug. 30, 1877.
3330.—FOULIS, W., "New or improved apparatus for lighting and extinguishing gas lamps, part or parts thereof acting as governors for lamps or for analogous purposes." Sept. 1, 1877.

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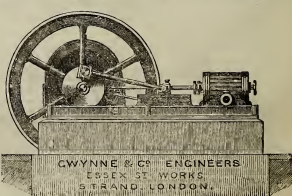
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TO CORRESPONDENTS.

H. S.G.—Address Major G. Warren Dresser, Editor, "American Gaslight Journal," 49, Pine Street, New York City.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 5, 1880.

Circular to Gas Companies.

THE half-yearly general meeting of the Commercial Gas Company was held on Friday last, when the Directors report and the statement of accounts, which will be found in another column, were presented and taken as read. The Chairman, Mr. R. Bradshaw, in the brief speech in which he sketched the history of the Company during the past half year, dwelt with excusable satisfaction on the handsome profit that had been made in that period, the steady progress which marks the Company's business, and the careful manner in which they have observed the requirements of the law respecting the purity and illuminating power of their gas. He pointed out the fact that the total receipts for gas were within a few pounds of what they were for the corresponding half of last year, in spite of a reduction of twopence per thousand cubic feet which has since come into operation. In connection with the recommendation to the meeting to declare dividends after the rate of eleven and a quarter and eight and a quarter per cent. on the new and old stocks respectively, which, it is unnecessary to add, were accepted unanimously, the Chairman made the gratifying announcement that the Directors had decided to reduce the price of gas to 3s. per thousand cubic feet, as from the 1st of January next. This is just as it should be. The Directors might well have divided another quarter per cent. on their stock, but instead of doing so they have carried forward a good round sum, which will help to assure the Proprietors of the continuation of their present dividends, in view of the recent issue of £60,000 of new stock, bearing interest from the commencement of the current half year, and also of the promised reduction in price. But the Chairman was not content to promise that the present rates of dividend should be maintained; he went farther, and held out hopes that by this time next year the stock of the Commercial Gas Company would be paying twelve and nine per cent. *annu.* Such statements were a fitting prelude

to the concluding portion of the Chairman's remarks, wherein he referred to the imminent retirement of Mr. Robert Jones, the Company's Senior Engineer, who has served them for twenty-six years, and in that time has seen his employers income quintupled and their dividends doubled. With this success Mr. Jones's name is linked, and it is only justice to that gentleman to say that he has kept the works and plant of the Company fully up to their increasing requirements and to the standard of the times. Mr. R. Jones will now retire in accordance with arrangements which the Directors, with the consent of the Proprietors, will proceed to make; and Mr. Henry E. Jones, his son, who has been for some years associated with him as Junior Engineer, will remain in sole charge of that department. From the expressions of opinion manifested at the meeting, Mr. R. Jones will take with him into his honourable retirement the gratifying assurance that the Shareholders of the Company with which he has been connected so long, and has helped to place in such a sound condition, have fully appreciated the value of his services. The Company are decidedly flourishing and strong, and if, as the Chairman anticipates, the Directors are able next year to pay the high dividends already mentioned, we may be sure, from the careful manner in which they have strengthened the Company's financial position during the past year, that they will be careful to still preserve a sufficient margin, and will not weaken their available resources merely to pay sensational dividends.

The Alliance and Dublin Consumers Gas Company have just held their half-yearly meeting, when a dividend after the rate of ten per cent. per annum was declared, leaving the sum of £5152 to be carried forward. The Chairman, Mr. E. Fottrell, had to mention in his speech the somewhat curious fact that the gas-rentals for the past half year are less by £2248 than for the corresponding period of 1879—a decrease which he was somewhat at a loss to account for, except on the ground that the weather during the half year had been brighter, or that the consumers were getting economical. The latter reason appears to be the more credible, especially as the Dublin people have, according to the Chairman, been continually blamed for wasting gas and afterwards grumbling at the amount of their gas bills. In spite of the decrease in the rentals and the diminished revenue from residuals consequent on a lessened consumption of coal, the profit on the half year's working has been £3300 more than was realized in the corresponding half of 1879, owing to cheapness of coal and economy in manufacture. The Directors are hopeful of good results in increased consumption of gas, without waste, from the recent exhibition of gas-cooking stoves and apparatus held under their auspices. The Company are beginning in a somewhat small way, perhaps, but still with much promise, to avail themselves of their powers to sell and let on hire gas stoves and fittings, so that with the efforts they are making to extend a knowledge of their staple commodity, and also to cheapen it, it may be expected that they will next have to record an increase in their business, instead of the opposite as at present.

The Sheffield United Gas Company also held their ordinary half-yearly meeting last week, but there was other matter besides mutual congratulations to be dealt with by the Chairman in his opening remarks. To begin with, the reserve-fund has been drawn upon to the extent of £2685, to make up the sum necessary for the payment of full dividends, and this somewhat disappointing circumstance had to be explained by the recital of a dismal series of troubles and losses which the Company have experienced during the last six months. Their gas is very cheap, having recently been reduced threepence per thousand feet, until the price now stands at 2s. to 2s. 4d. The consumption of gas has increased, apparently to the Directors satisfaction, but the threepence was a heavy drop to be compensated for. Then their expenditure on retort repairs has been £4388 more than during the corresponding period of last year, and a coke shed fell down, causing a loss of £1288. A sewer had also to be reconstructed at a cost of £745, and over £300 went in altering scrubbers. Local rates were £874 heavier than before. It is therefore not to be wondered at that even an elastic revenue failed of being proof against such a number of exceptional assaults. But there is no cause for alarm in all this; the reserve-fund is intended to meet such emergencies, and it might be said with equal truth that in the present instance it has been drawn upon, say to equalize the charge for retort repairs, as for making up a dividend. If reserve-funds were never required they would never be formed. It is hardly to be expected that another six months will have so many unpleasant surprises in store for the Company as the past half year, and by the end of December it

may be taken for granted that the gas-rentals will have reached their normal proportion. It would be most unfortunate if a Gas Company selling at such a low price were to be discredited, while a Corporation can succeed in keeping down to the narrowest possible margin. There is no difference between the two organizations to prevent one doing as well as the other, and we shall therefore rejoice when the Sheffield Company are on an even keel again.

The two colonial Gas Companies—Australian and New Zealand—whose reports we publish elsewhere, are both examples of successful enterprise and rapid development of civilized appliances in new countries. The Australian Gas Company, whose works are at Sydney, took their name when the general title was of more local application than it is at present, when there are in Australia other Gas Companies than the metropolitan one. The profits of the Company for the half year ending last "winter"—June 30th—amount, with the balance carried forward, to £24,351, and a dividend of seven and a half per cent. for the six months was declared at the last meeting. The Company have been compelled, by the increase of their business, to purchase additional land and erect new works. The Auckland (New Zealand) Company is a more modern concern than its Australian neighbour; but it is rapidly growing, and stands exceedingly well as regards financial position. The advantages of gas are fully appreciated in the Antipodes, and the dividend paid on flourishing gas stocks are such as to make the early promoters of gas undertakings congratulate themselves on their far-sightedness in so investing their money at times when many more dazzling investments were seeking to attract capital.

The case of *West v. The Phoenix Gaslight and Coke Company*, of which we give a report in another column, is one of those instances of apparently arbitrary proceedings on the part of a Gas Company against a defaulting consumer's successor in premises supplied with gas. These cases are now as rare as they were at one time common. The plaintiff in the present suit moved into a public-house, the previous tenant of which had become bankrupt and left his gas account unpaid—the broker being, in fact, on the premises at the time—and on the day following the plaintiff's entry he received notice from the Gas Company's collector, to the effect that unless the outstanding account was paid, the gas would be cut off, which was, in fact, done later in the day. In order to get a supply for the evening, the plaintiff paid, under protest, what was due, and afterwards brought the present action to recover the amount so extorted, as he contended, by illegal pressure. A verdict was eventually found for the plaintiff for the amount claimed, with costs, in pursuance of clause 39 of the Gas-Works Clauses Act, 1871, which expressly states that an incoming tenant is not to be held liable for arrears of gas left unpaid by a former tenant, except there is an agreement between them by which the former undertakes to pay such arrears. In this case the plaintiff denied the existence of any such agreement; but as he appears to have consumed the Company's gas for at least one night before it was cut off, and there is no record of his having made any application for a supply of gas on his own account until he was compelled to do so, the Company's officials were not so much to blame for having suspected "collusion" between the new and former tenants, especially as they may have had clause 39 of the Metropolitan Gas Act, 1860, in their minds, wherein this word is mentioned. The term is, however, so vague, and it is so difficult to determine what possible collusion, taken as meaning a conspiracy, there could be in such cases, that the more definite language of the later Act is decidedly preferable; and as the 1871 Act must be held to be explanatory of the Act of 1860, no other issue of the case in point was possible; and it is therefore unfortunate, the grounds of the Judge's decision being so plain, that the Company's officials should have been so misled as to have taken the high stand they did, without satisfying themselves that they were within the strict letter of the law in so doing.

The North of England Gas Managers Association had a very successful and pleasant gathering last Saturday, under the presidency of Mr. J. H. Cox, the handsome board-room of the Sunderland Gas Company being used for the business part of the meeting. Mr. Cox in his opening address referred to some of the early attempts at gas lighting in Sunderland, and to the advantages of assemblies of professional men such as those resulting from the various Associations of Gas Managers. The recent catastrophe at the Seaham Colliery, which is in the immediate neighbourhood of Sunderland, was afterwards brought under the attention of the meeting, and a proposition

was carried to contribute a sum of ten pounds from the funds of the Association towards the relief of the distress resulting from the accident. Papers were then read by Mr. J. T. Jolliffe and Mr. W. J. Warner; the former on "The Utilization of the Waste Heat from the Retort Flues for the Generation of 'Steam';" while the latter was entitled "Some Notes on the 'Work of Purification.'" Both papers were well discussed. After the meeting the Chairman of the Sunderland Gas Company (Mr. W. Robson) invited those present to luncheon at the Hendon Gas-Works, and to an inspection of the extensions there carried out by Mr. Hawksley. Many of the members, on arriving at the works, expressed considerable surprise at the very picturesque entrance—the Manager's house being there, a villa surrounded by shrubs and flowers and having an extensive lawn and cricket-ground attached. A visit to these works could not fail to remove many prejudices that might be entertained as to the insalubrity of such places. Mr. Robson, who presided at the luncheon, was, as usual, most happy in the remarks with which he proposed some of the principal toasts given at the conclusion of the proceedings. We shall in future issues give a report of the whole meeting.

The Glasgow exhibition of apparatus and materials used for the purposes of lighting and heating was opened by the Lord Provost, in presence of a numerous company, on Tuesday last, and bids fair to be a great success. Exhibitors have come forward with commendable alacrity in response to the invitation of the Executive Committee, and the exhibition is without doubt the most important of its kind that has yet been held in any part of the United Kingdom. As might have been expected, the popular character of the show has had some influence in determining the relative proportions of the classes of exhibits, those articles which appeal to the general public being shown in greater numbers and variety than the manufacturing appliances which are of more direct interest to members of the profession of gas engineering, though, on the other hand, most of the water-fittings are of a decidedly technical character. As a more detailed account of some of the exhibits will be found in another column, we need not more particularly refer to them here. We must, however, congratulate the Executive Committee, as well as the original promoters and patrons of the project, among whom the Philosophical Society and the Corporation of Glasgow stand first, on the success which has so far attended their efforts, and which we may hope will be added to in other ways while the exhibition remains open, and after it has closed. Without wishing to import any controversial element into this expression of our satisfaction at the results that have been achieved, we cannot help noticing, in connection with a matter that has already engaged our attention in reference to the conduct of these exhibitions of gas apparatus, the testimony which is afforded at Glasgow of the complete, and it is to be hoped final collapse of certain influences tending to the restriction of the value of these competitions as tests of manufacturing progress in at least one highly important direction. Of this we will say no more at present, trusting that such an unpleasant matter may soon be forgotten, except for the warning which it has afforded. The present exhibition may be said to have demonstrated the possibility of giving an importance to the periodical assembling of those classes of appliances embraced by it, which we trust will not be lost sight of by those who are primarily interested in the progress of the manufacturing industries involved. We see no reason why an exhibition of sufficient note to attract universal attention should not become an annual event, to be held in different large towns where facilities exist for making it commercially successful as well as of real scientific interest. A guarantee-fund and the necessary central organization might be formed without any great difficulty, and the British Association of Gas Managers might be very properly interested in an effort which could be made productive of much good in many ways. The yearly progress of invention might thus be plainly demonstrated, and meritorious improvements in apparatus for the manufacture and utilization of gas would secure more conspicuous notice than when brought at hap-hazard before the public as at present. We believe, in short, that the time has come when the proceedings of the associations which have done so much to forward the science of agriculture and the allied arts, might be successfully copied by the friends of that highly important and far-reaching branch of modern industry which is concerned with providing artificial illumination for the teeming urban population of this country, and that a powerful Association with such an object would be of service not merely to the individual interests comprised within its range, but also to the community at large.

The Winter Instructions of the Metropolitan Gas Referees have been issued, and state the amount of impurity to be permitted in the gas supplied from the works of the Metropolitan Gas Companies. The maximum amount of ammonia allowed is 4 grains per 100 cubic feet. In the gas made at Beckton, Bow, and Bromley the maximum amount of sulphur allowable will be 20 grains per 100 cubic feet, and in the gas made at the other stations of The Gaslight and Coke Company and at the works of the South Metropolitan Gas Company and of the Commercial Gas Company, it is fixed at 25 grains. The Referees give notice that after the present winter the distinction made hitherto in favour of urban works will cease, so that we may in future expect to see all the gas used in the Metropolis tested under equal conditions. These being the first Instructions issued by the Referees since the passing of The Gaslight and Coke and other Companies Amendment Act, 1880, notice is given that the Referees will shortly issue further Instructions relative to the mode of testing for pressure in accordance with the provisions of that Act. Additional testing-stations will also be prescribed for the districts recently acquired by the South Metropolitan Company.

Water and Sanitary Notes.

THE idea so acceptable to Sir William Harcourt and others, that London should be supplied with water by means of a huge aqueduct bringing a supply from a distance, receives a timely correction by the report which has lately arrived from New York. We are told "it is felt that, should any accident 'happen to the Croton Aqueduct, very serious consequences 'would ensue.' It is therefore proposed to build a new conduit, which will serve the twofold purpose of increasing the quantity of water furnished to the city, and of lessening the risk that the supply will be entirely cut off. That much benefit would accrue from the unification of the eight water undertakings of the Metropolis, is a point which can scarcely be disputed; but it is another matter to make everything hang on one thread, and render the supply of an immense city dependent on the integrity of a single line of communication. The distribution of the sources of supply is in itself an advantage, as any break-down would be but partial—a matter of great moment both in reference to the ordinary wants of the population and the incident of a large fire. If military considerations are to have any weight, nothing could appear more imprudent than to concentrate the water supply of London into one great aqueduct. If the idea of war within the limits of Great Britain be deemed altogether visionary, we have yet to consider the wild and diabolical freaks possible to Fenianism and other political combinations or conspiracies. In these days of dynamite and Thomas machines, society is liable to be shocked by deeds which are even worse than those of war. Dismissing all these possibilities from the argument, we have yet to consider the likelihood of accident occurring. If New York feels it necessary to be cautious on this point, assuredly there is every reason why London ought to be on its guard.

The extreme improbability of finding a pure and adequate supply of water for the people of Exeter by sinking wells in the vicinity of that city, has just been shown by Mr. Thomas Andrew, in a paper read before the recent Sanitary Congress. Between two and three years ago, the Corporation of Exeter purchased the water-works from the Company to whom they belonged, and since then there has been an agitation for superseding the Exe water by means of deep wells. Nearly all the existing wells are found to be seriously polluted, and Mr. Andrew explained that the geological features of Exeter and its vicinity were such as to discourage the idea of seeking a supply of water from subterranean sources. A boring 300 feet deep had only yielded very little more than was wanted for the purposes of the brewery with which it was connected. Exeter has in its very centre an extinct volcano, which in its days of activity so disturbed the adjacent strata that they are too much inclined to favour the collection of underground water. Even Mr. Rawlinson was obliged to own that the case was desperate, though he thought there must be places not very far distant where a good supply could be obtained if the river was not satisfactory. He recommended the Town Council, before expending any money on well-sinking, to read the Sixth Report of the Rivers Pollution Commission. The Mayor of Exeter considered it was very fortunate for the citizens that the discussion had been raised. He had arrived at the conclusion that the Exonians should now set to work and call upon the towns on the banks of the Exe to stop the flow of sewage into the river. A paper bearing on the same

question was subsequently read by Mr. Frank P. Perkins, the Public Analyst for the city of Exeter, wherein the generally unwholesome quality of the well water was set forth by numerous examples. The river appears to be the only source, unless the city is prepared to meet the expense of seeking a supply from a distant locality.

Edinburgh has received the benefit of a Water Trust in the place of the Water Company which formerly existed. The citizens were promised cheaper and better water under the new system, but complaint is made that the supply now given is both dear and bad. The water-rates are rising, and there is the prospect of a further outlay of £50,000 on the capital account. This expenditure is for the purpose of carrying out a scheme which it is said will make the supply no better in quality, but rather worse, as the source to be drawn upon only yields water of a "wretched character" and "undeniably unwholesome." The cost of the new works is said to have amounted already to £480,000, which is far in excess of the estimated cost when the scheme was submitted to the ratepayers. Discontent is thus rife in "Auld 'Reekie," and the only consolation we can suggest is that the sufferers have the honour of furnishing a useful example for the consideration of the inhabitants of the great Metropolis.

The Corporation of Windsor, as the Urban Sanitary Authority of the Royal Borough, have just found themselves in the anomalous position of being fined for polluting the Thames. The Conservators of the River were the prosecutors, and so far did their duty in seeking to protect the stream. But the work was done in rather a bungling way, the sample of effluent water on which the prosecution was founded being taken after a fashion which would scarcely have satisfied some tribunals. The process of purification employed by the Windsor Corporation in their treatment of the town sewage, is that invented and patented by Mr. Hille; but it was stated in evidence that the works were not yet complete. Another fortnight, it was alleged, would see everything finished, and the cost of the works constructed for the purpose of complying with the demands of the Conservators was £42,000. Still, it was sufficiently clear that on the evening of a certain day in June last a polluting liquid was flowing into the Thames from the outfall of the Windsor sewage works. Consequently, a small fine was inflicted—namely, £5. The costs incurred by the Conservators were stated at ten guineas, and the bench of Berkshire Magistrates, before whom the proceedings, as reported in last week's JOURNAL, took place, ordered the Windsor Corporation to pay one-half. It is to be hoped that this will be the last occasion on which it will be necessary to prosecute the Windsor authorities for polluting the Thames. They have enjoyed a long day of grace, the original notice from the Conservators having been served upon them as far back as thirteen years ago. It is satisfactory to learn that analyses of the effluent water, taken both before and after the legal proceedings, have not shown anything amiss.

The ventilation of sewers is a troublesome and disquieting topic. But the subject is one which must be fully considered and practically dealt with, or the poisonous gases will do their deadly work. It is evident that some towns—and we fear there may be many—which have carefully provided for the removal of the liquid sewage, have to a great extent shirked the question of the gaseous matter. A suggestion has been revived for ventilating the sewers up the shafts of the street lamp-posts. But here there is the double danger of poisoning the lamp-cleaners, and of pouring volumes of sewer gas into the windows of the houses. Ventilating gratings in the middle of the street could scarcely do more harm than the lamp-posts charged with sewer gas. When the gas is burning there might be a peculiar advantage in the lamp-post system, but that would only be for a portion of the twenty-four hours. A Winchester brewer has dealt with the question, so far as his own premises are concerned, by leading the gases into his brewery chimney, up which they take their course, thereby relieving his cellars from the inrush of sewer gas which formerly made them offensive. On the same principle it is urged that houses should have ventilating pipes connected with the drains and water-closets, and leading up to a higher level than the windows. A bye-law to enforce such an arrangement is said to exist in Winchester, and is considered to answer well.

THE Gas Committee of the Manchester Corporation are enabled, out of the profits realized during the year ending the 24th of June last, to hand over a sum of £32,000 to the Improvement Committee for the purposes of city improvements. A reduction in the price charged of 2d. per 1000 cubic feet is to be recommended to the Council.

THE GLASGOW EXHIBITION OF ARTIFICIAL LIGHTING APPARATUS.

FIRST NOTICE.

The exhibition of apparatus connected with artificial lighting, now open in Glasgow, is a completely successful attempt to show in close contiguity the principal substances and appliances in common use for the purpose of illumination. A fair field has been preserved for all kinds of lighting media, and the fact that coal gas, in its primary and subsidiary applications, forms the most prominent of the several groups of exhibits, although only what was expected and hoped for, must still be accepted as the result of the commanding importance of gas lighting, and is not due to its having been specially favoured by the Committee entrusted with the organization of the exhibition.

The initiative of the show was taken, as our readers are doubtless aware, by the Philosophical Society, and the idea was warmly seconded by the City Authorities, who agreed to give the gas and water required, and also consented to the appropriation of the surplus funds of an industrial exhibition held in 1845, to form a guarantee-fund for the proposed display. The project having thus taken form and substance, a site was chosen, and the Executive Committee were fortunate in finding, in the Burnbank Drill Hall and grounds, a building spacious enough to contain by far the greater portion of the exhibits, and also ample facilities for the erection of a temporary lecture-room and the indispensable annexes. The exhibition buildings stand over a hundred yards back from the Great Western Road, and the approach is lighted up at night with several of Wigham's and Sugg's powerful lamps. Beside the pay-stall is a wooden structure, from which one of Wigham's patent burners, with a complete first order dioptric fixed-light apparatus, is intended to be exhibited with the varying fog powers of burner as in lighthouses. Just within the turnstiles, to the left of the entrance, one of Pintsch's patent gas-lighted buoys floating in a tank, with its light shining day and night, is a conspicuous object.

In the principal building an attempt has been made to take advantage of the equal division of the hall along its length by the double span roof, and to have one half lighted by gas and the other, nearer the entrance, by the electric light, all windows and other openings by which daylight might enter being darkened, in order to keep the exhibition always lighted by artificial means. Unfortunately for the complete success of this intended competition, the electric light was not in proper order on the opening day. It was in action at Messrs. Stodge's stand for a short time, but eventually broke down, and the gas was left in sole possession. It is needless to say that the gas-lighted half of the hall, provided as it was with several of Sugg's, Wigham's, and Bray's powerful lamps, was very brilliantly illuminated, the celebrated 28-candle Glasgow gas showing to great advantage in the various splendid burners in action, and giving light, measurable by hundreds of candles, in any part of the portion of the building referred to. It was noticeable that no one complained of the brilliant illumination as at all trying to the eyes, the steadiness with which it was maintained relieving the muscles of the iris of much of the strain always resulting from flickering lights, whether electric or otherwise. But if the light was not oppressive, the heat from the many stoves and burners was most decidedly so, the ventilation of the building being woefully defective. For this the Committee are not entirely to blame, as they had made arrangements for working two ventilating fans, by Schiele and Pelzer respectively, by which the air of the hall was to have been changed every eight minutes; but neither of these machines could be got ready in time, and the result was very unfortunate, giving ground for the complaint of perspiring visitors that some other means of ventilation should have been made available. Before these remarks are printed, however, it is probable that this inconvenience will have ceased to exist, so that intending visitors need not absent themselves from the show for fear of being asphyxiated.

The forward state of the exhibition at the time fixed for the opening was very creditable, both to the Committee and to the Exhibitors. Very few stalls, comparatively speaking, were bare of their proper furnishing at two o'clock on Tuesday last, when the unpretentious opening ceremony, particulars of which will be found in another column, was performed by the Lord Provost; and to describe the appearance of the show at that time in general terms, before entering into particulars, it may be said to have presented a complete, bustling, and business-like aspect, most gratifying to those who promoted the undertaking, and were present to see their most sanguine anticipations as to the varied and comprehensive character of the exhibits fully realized. The stands, 172 in number, comprising thousands of articles, were ranged round the Drill Hall and in lines down its length, while some exhibitors had to take refuge in the annex, and outside the building. The official catalogue was very accurately compiled, and the classes of exhibits were arranged with as much regard to proper sequence as could be secured.

Immediately opposite the entrance is to be found Mr. James Keith's large stand, a special feature of which is an ornamental column and fountain, surmounted by a coronet of gas-lamps which light up the splashing water with striking effect. Some large boilers for gas heating are shown by Mr. Keith, and also a "Rider" hot air engine worked by gas. Passing onwards, we take the catalogue for our guide, and find that the honour of being first on the list belongs to Mr. James Binnie, of Gortoch, who exhibits a good collection of fire-clay retorts and bricks. Then we come to a series of samples of Scotch coals and canals, the contemplation of which can scarcely be considered exciting; we may note, however, a good piece of fossil in canal, consisting of a section of a tree of about

15 inches diameter, from the Boghead colliery, Torbanehill. The Scotch colliery owners and agents have not all their own way, for samples of English, American, and even Australian coals are on view, —more, of course, as curiosities than with any serious intention of fighting the Scotch minerals on their own ground. Mr. James Dunnachie, of Glenbogie, shows some well-made fire-clay goods, among them a brick-built retort on Mr. Hislop's plan. For some reason none of the English makers of fire-clay goods are represented in this exhibition, and this is rather to be regretted. Mr. David Corrie Glen has a very handsome case of specimens of coals, shales, and hydrocarbons, commencing with the precious crystallized perfection of carbon known as the diamond. The coal-mining section is also supplied with many specimens of safety-lamps, and various kinds of fire-damp indicators. Conspicuous among these are some examples of Ansell's fire-damp or choke-damp and gas-leakage indicators, which, as already explained in our "Notes" column a few weeks since, act on the principle of the diffusion of gases. Mr. Wilson, of 123, St. Vincent Street, Glasgow, shows an apparatus consisting of a balanced balloon for the same purpose. Professor Forbes's "Damoscope" is also on view, and, in the hands of the attendant, indicated the presence in the atmosphere of the hall of one-half per cent. of gaseous vapour, presumably from the liquid hydrocarbons unavoidably spilled and wasted from the various lamps, gas machines, &c. This ingenious instrument depends on the difference in tone given by a tuning-fork in atmospheres of varying density. A curious little arrangement for indicating the presence of gas in the holds of vessels, or in mines, or, in fact, anywhere that can be reached with a pipe, was shown by Mr. W. Young, of Belfast, and consisted of a graduated glass tube, in which fumes of hydrochloric acid could be made to rise to a height proportional to the amount of gas in the atmosphere exposed to the acid, the necessary acid reservoir and aspirator being comprised in the apparatus.

Following the course of the manufacture of gas, having noticed the raw material and the construction of the retorts, we must now draw attention to Messrs. Laidlaw, Sons, and Cairn's important exhibit of apparatus for use in gas-works, including a handsome steam-engine and exhausters intended for erection at the Salford Gas-Works. This stand, which is situated at one end of the hall, attracted much notice, and forms a fair epitome of the firm's special manufactures. We must not omit to mention also a pretty model of a complete small gas-works included in Messrs. Laidlaw's exhibits. There was no other show of engineering specially connected with the manufacture of gas of equal importance in the exhibition. Messrs. Macfarlane, Strang, and Co., Limited, of Glasgow, show specimens of cast-iron pipes, made with Macfarlane's patent sand-core-bar, possessing great internal smoothness and regularity of section; the same firm also show several examples of Painter's patent hydrostatic joint. The North British Metal Company show specimens of Spence's metal in ingots, and also in pipe joints and ornamental medallions, &c. A peculiar though somewhat complicated looking self-sealing retort mouthpiece and lid, fitted, is shown by Messrs. W. Grice and Co., of Birmingham, and there are several stands of wrought-iron pipes and fittings, and screwing tools, &c. Messrs. J. G. Williams and Co., of the Victoria Paint-Works, Manchester, have the only stand of specimens of paint suitable for gas-works and exposed ironwork generally; they show a handsome model of a pair of gas scrubbers, by Dempster, painted with their metallic oxide paint in various tints. Messrs. Owens and Co., of London, show a Blake's direct-acting steam-pump and some Mann and Owens gas-valves, finished in their usual style; and gas-valves and fittings are also shown by Messrs. Alley and Maclellan, of Polmadie, Glasgow.

Meters are well represented, Messrs. George Glover and Co., of London, being conspicuous with a stand of very beautiful specimens of workmanship, including a standard cubic foot bottle fitted up as a transferer, and nickel plated. Messrs. Glover also show a 5-feet standard model gas-holder, a *fine simile* of those deposited with the Board of Trade. The Imperial Meter Company, of St. Pancras, London, show one of their 10-light meters, and Messrs. D. Grant and Co., of Edinburgh, have a case of well-made pressure-gauges and fittings, and show some good meters. Messrs. Cowan, of Edinburgh, have a striking show of their widely-known manufactures in this department, and help to maintain the credit of the Northern meter manufacturers, as do Messrs. D. Bruce Peebles and Co., of Bonnington, Edinburgh, who show a goodly number of special articles of the class for which the firm are celebrated. Among other things, Messrs. Peebles show the reliance that may be placed on their street-lamp governors, by fitting a lamp-post with a clock, which gives the consumption of the burner by recording the hours during which it is in operation, instead of measuring the actual gas consumed, as is the ordinary working of the average system of street-lamp lighting. The change is an improvement in the direction of saving in apparatus and increasing the convenience of applying the system. A system of flash signalling by reflected gas-lights, included among the interesting objects contributed by Messrs. Peebles, attracted much attention.

Of regulators and governors of various kinds and sizes there is a plentiful supply, most of which, however, possess little claim for notice on the ground of novelty. Without including the governors fitted to burners, it may be said that ingenuity has apparently exhausted itself in the different shapes and surroundings with which the well-known principle of a gas governor has been dressed up, as manifested by examples shown in the present exhibition, some of which, such as that sent by Mr. Busch, claiming distinction as being the oldest as well as the best, and others advocated by reason of their novelty and consequent excellence; but none were deserving

of more than the general praise that can be well accorded to any really serviceable apparatus of this kind.

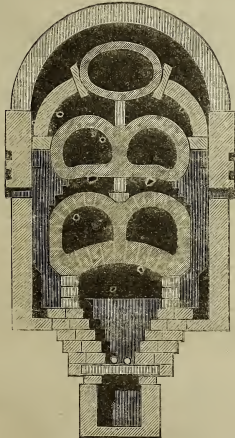
We may now pass on to notice the various exhibits of gas-burners and lamps, which form one of the most important classes into which the articles in the exhibition are divided. We have already referred to the powerful burners for intense illumination shown by Messrs. Sugg (through Mr. Nelson, of Gordon Street, Glasgow), Messrs. Edmondson (through Messrs. P. Watt and Son), and Messrs. Bray, of Leeds, concerning which it is only necessary to add that they were distributed where needed to give the daylight brightness which was maintained in the gas-lighted half of the building and outside it. Coming down to the humbler requirements of internal house lighting, there are many specimens of burners and lamps shown, in which the brilliancy of the light and the elegance of its "installation," as our French neighbours would put it, contend for admiration. Mr. Sugg's goods were most striking, and the stand at which they were exhibited was one of the largest in the hall, the well-known Argand and "Christiania" burners, and their accompanying fittings in use, making a brave display. One of Sugg's Lethby Photometers was also shown, as also Methven's gas-testing apparatus, and some of Sugg's new lamp governors. Not far from Mr. Nelson's stand was the business-like show of Messrs. Bray, of Leeds, the principal part of whose space was filled with specimens of their starlike burners, although they also had on view some elegant brackets, &c., fitted with their improved globes and burners in use. Beyond these were several exhibits of more or less ingeniously constructed burners and gas-lamps, the productions of Mr. Heron, of Manchester, and others of less importance.

Notes.

[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

MR. G. ANDERSON'S IMPROVED RETORT SETTINGS.

The accompanying engraving is a representation of an improved system of retort-setting recently introduced by Mr. G. Anderson, and brought into use in the course of last month at the Kilkenny Gas-Works. The setting consists of one twin brick retort over the fire, one twin clay retort directly over the brick retort, and of the same dimensions, and one oval clay retort in the centre above. The twin retorts are each 12 inches by 10 inches, and the top retort 15 inches by 10 inches in section, and 8 ft. 6 in. long, and the width of the setting is 3 ft. 6 in. In the course of the trial of this system at



Kilkenny the retorts were charged every three hours with about a hundred weight of coal, varying slightly according to the heats, and the quantity of gas produced was on the average 11,592 cubic feet. The average make per mouthpiece per day was 4754 cubic feet, with a small consumption of coke, the heats moreover being moderate. Notwithstanding this high make of gas, not the least alteration was observable in its illuminating power, the gas supplied in the town being, in fact, rather better than usual. The jet photometer at the works generally stood at the customary height, though it dropped a little before every draw, but not more than in working any other setting. The exhausters were worked at the same vacuum as usual.

The points to which attention may be drawn in this system are—(1) the small dimensions of the retorts, (2) the increased quantity of gas made per ton of coal, and (3) the large make per mouthpiece. In drawing the charges, the first retorts taken are the right-hand bottom and the left-hand middle retort; an hour later the three other retorts are drawn. Thus there is one hour's rest, when the operation is repeated, giving eight charges in the 24 hours. The charges, in the trial at Kilkenny, were all fairly burnt off, the coke produced being rather smaller than usual, though quite large enough for domestic or any other use. The oven in which the retorts were set was a wide one, narrowed by brickwork to the width required. Small hot-air flues were provided in the side walls, for admitting air in the event of carbonic oxide being formed in the furnace; but they were not brought into use. From the small quantity of coal put into the retorts at a time, and the way in which they are relatively charged, much less cooling takes place, much less tar is formed, and there is, consequently, a larger yield of gas. One objection to the arrangement may be urged—that the retorts are too small for large works; however, no difficulty has been experienced in charging or drawing, and therefore for many country works they might even be preferred to larger sizes, as the work can be done by inferior men, and each retort is open but a very short time. Several settings of 15 in. by 10 in. retorts on this plan are, however, about to be erected at works where 40 million cubic feet of gas are made annually, and every means will be adopted for thoroughly testing the gas, tar, and liquor produced in the course of the trial, which it is expected will extend over three months in the course of the ensuing summer.

A NEW GAS AND STEAM ENGINE.

A gas-engine of peculiar construction has been patented by Messrs. S. Hallam and G. L. Scott, of Manchester, and the specification, which has recently been printed, describes many features in the invention which appear to be ingenious and novel. The inventors consume gas to generate steam, and provide certain arrangements whereby the products of combustion are used as propelling media in aid of the steam. To effect this the gas is burnt in a chamber under pressure. The carburetted hydrogen, or other suitable gas, to be used as fuel, and the air necessary to support its combustion, are separately compressed, and are then introduced in proper proportions into a combustion chamber formed in a steam generator, and are there ignited. The heat of the combustion thus produced is used to generate steam, and the combustion products pass into a kind of smoke-box, which communicates through a back-pressure valve with the interior of the boiler or steam passage. On starting, the products may be discharged into the air, or into the cylinder of the engine. A means of washing the smoke-gases is also provided, if required. The boiler specified as suitable is of the ordinary vertical form with internal water-tubes. The chambers for receiving the compressed air and gas are formed in the base-plate of the boiler. Uncompressed air and gas are formed at first to generate steam sufficient to start the engine, after which the gas and air are delivered under pressure by their respective pumps in sufficient volumes to keep up combustion. So soon as the pressure in the furnace chamber becomes higher than that in the boiler, the before-mentioned back-pressure valve opens, and the products of combustion are discharged into the separator or boiler, whereby their temperature is reduced to that of steam under the given working pressure. The products of combustion mix with the steam, and pass with it to the working cylinder of the engine. Means are also provided to ignite the gas under pressure by spongy platinum, and so get up pressure to start without raising steam. The motor may thus be started as a gas-engine, and afterwards worked as a gas and steam engine combined.

THE DISTILLATION OF COAL TAR.

Time was when tar and liquor were so worthless that the gas manager's ingenuity was greatly taxed to find out how to lose them, whereas now the greatest vigilance is evinced to find out how to catch and turn them to profitable account. The utilization of the liquor on the works has long been an established fact, but the elimination of the essentials of coal tar on the spot has not apparently received the same amount of attention. Perhaps the difficulties and attendant danger connected with the process, and which are dealt with in the improvements recently patented by Messrs. Trewhy and Fenner, of Beekton, stood in the way. If so, all who are anxious to deal with this product themselves cannot do better than read the abstract of the specification of their patent which is published in another column.

A RESULT OF ENTERPRISE IN THE COLONIES.

The Secretary of a Gas Company in New Zealand sends a local paper in which appears a paragraph advertisement, among the news, setting forth the advantages of the use of coke for the generation of steam in short or vertical boilers. He states that he has arranged for it to appear on alternate days, for, say, two or three weeks, and then he will alter it, advocating that "gas is superior to every other light-giving agent;" then that "cooking by gas is the best of all means," &c.; and so on all the year round. During the past year he says he has had a similar arrangement in force with another paper, and thus has kept the Company's manufactures constantly before the public. He has found that the best result has been obtained with coke. Two years since an immense pile had accumulated at the works, local coals were being sold for about 18s. per ton, and no one seemed disposed to take any coke. The result of the paragraph appearing was very gratifying. All the coke was disposed of at 20s. per ton, and a demand being created, the price was raised to 25s. per ton, at which price the Company are now

selling all the coke they make, good steam coal being procurable at 17s. 6d per ton in quantities. The "Otto" gas-engine and cooking stoves have been pushed by the same means. There are eleven engines running—nominal horse power 256. The number of gas-stoves has been increased from 42 to 156 in 15 months. The price of gas being 10s. per 1000 feet, English gas managers with gas at a comparatively low price might take courage from this experience. The coals used by the Company are imported, and cost last year 35s. per ton.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by our correspondents.]

GAS APPARATUS EXHIBITIONS.

SIR,—We were glad to see in the JOURNAL of the 21st ult. a letter from Messrs. Beverley and Wyldie exposing a recent attempt made by Messrs. Leoni, Wright, Billing, Hassall and Singleton, Davis, and Wilson, to exclude all other makers of gas stoves from competition at the gas apparatus exhibitions of Belfast, Dublin, and Glasgow; also your remarks thereon. This week we notice that Messrs. John Wright and Co. deny the statements made by Messrs. Beverley and Wyldie, and whilst admitting that an association does exist, they insist that it was formed with a view to the public good, by preventing such exhibitions drifting into "Cheap Jack bazaars," and to check "certain manufacturers whose commercial morality in the matter of piracy of designs," &c., would, in their opinion, "scarcely bear the light of day."

As one of the firms objected to, we should like, through the medium of the JOURNAL, to ask a few questions with a view of proving what the object of the association really was.

Is it not a fact that either Mr. Leoni or Mr. Ernest Wright, as representing the association, called upon the managers of the several exhibitions at the places named, and stated that the members of the association were the largest gas stove manufacturers in the kingdom; that without their assistance a successful show could not be had, and threatened that if any others were admitted they should decline to exhibit? Again, will Messrs. John Wright and Co. describe a single point of resemblance, in design, appearance, or principle, between our stoves and any other gas stoves ever before made; or state that they are in any sense of a "Cheap Jack" description; or name a single instance where we have refused to supply goods at prices marked at shows?

If none of these charges can be made against us, and the object of the association was as stated, why did they persistently endeavour to exclude us, and only admit us to the Dublin Exhibition on the last day, and after our threatening and taking active steps to open a second exhibition, and expose the attempted monopoly to the public of that city?

Torquay, Oct. 2, 1880.

J. C. STARR and Co.

Legal Intelligence.

SOUTHWARK COUNTY COURT.—MONDAY, SEPTE. 27.

(Before Mr. STONOR, Judge.)

ILLEGALLY CUTTING OFF SUPPLY OF GAS.

At the sitting of the Court this day, the Phoenix Gas Company (now amalgamated with the South Metropolitan Gas Company) were sued by Mr. West, of Warner Street, New Kent Road, for £9 3s. 8d., money paid to them under the circumstances hereafter detailed.

Mr. LYON appeared for the plaintiff; Mr. METCALF for the Company. Mr. LYON, in opening the case, said that the premises, which occupied the Beehive public-house, in Warner Street, New Kent Road, sued the Phoenix Gaslight and Coke Company to recover the sum of £9 3s. 8d., which he had paid to them under the following circumstances:—On the 30th of June last the plaintiff moved into the Beehive public-house, the former tenant, a man named Suppit, having left the premises insolvent. On the following morning a collector of the Gas Company called upon him, and stated that the above sum of money had been left owing by the former tenant for gas supplied to the house, and asking Mr. West to pay the money. He at once refused, saying he was not liable for other people's debts; but the collector replied that if the money was not paid at the Company's office by noon of that day the gas would be cut off. Mr. West thought this was merely a threat; however, at three o'clock on the same afternoon the gas-pipe was disconnected. The plaintiff at once drove to the office of the Company, and offered to pay the money on deposit, while the case was argued. To this the Company declined to agree, and would not allow the gas to be again supplied to the premises until the money had been paid. Finally, Mr. West, to avoid further inconvenience, paid, under protest, the amount demanded, and the gas was again supplied, though not until between seven and eight o'clock in the evening. These were the facts of the case, and he (Mr. LYON) was sure they would not be disputed by the Company.

The JUDGE: The Gas Company had certainly no legal right to cut off the supply of gas from an incoming tenant because the former occupier of the premises had not paid his gas bill.

Mr. LYON said that he had not, as the Gas-Works Clauses Act, 1871 (34 & 35 Vict., c. 41, sec. 39), stated that "In case any consumer of gas supplied by the undertakers leave the premises where such gas has been supplied to him without paying the gas-rent or meter-rent due from him, the undertakers shall not be entitled to require from the next tenant of such premises the payment of the gas-rent or meter-rent due from the former tenant, unless such incoming tenant has undertaken with the former tenant to pay or exonerate him from the payment of such arrears." His client had certainly not made any such agreement.

Mr. METCALF, on behalf of the Company, said the reason of the action being taken by them was that their officials had a suspicion that there was collusion between the plaintiff and the outgoing tenant to defraud the Company of their money.

Mr. West was then examined, and the evidence corroborated the statement of his solicitor.

Cross-examined by Mr. METCALF, he swore that not until after he had moved into the premises did he know anything whatever about the amount owing for the gas, and he had certainly not made any agreement or promise, either to the outgoing tenant or to the Gas Company, to pay the money.

Mr. LYON, one of the Company's collectors, was then called, and in cross-examination by Mr. LYON stated that when the premises were about

to be transferred the gas account was rendered, and the broker of the former tenant said that it should be put upon the statement of claims. The JUDGE said he considered the Company had no legal justification for their proceedings in the present case, and he should give judgment for the plaintiff.

Mr. LYON applied for costs upon the higher scale, on the ground of provocation.

Mr. METCALF objected, urging that the Company had been put to considerable inconvenience and loss of time.

Judgment was eventually given for the plaintiff, with ordinary costs.

Miscellaneous Items.

EXHIBITION OF GAS AND ARTIFICIAL LIGHT APPARATUS IN GLASGOW.

The Exhibition of Gas and Artificial Light Apparatus which has for some time past been in course of arrangement under the auspices of the Philosophical Society of Glasgow, was opened in the Drill Hall, Bannockburn, on Tuesday last, the ceremony being performed by the Lord Provost in the presence of a numerous company.

The exhibition comprises every kind of gas apparatus and appliance, including gas-burners, gas cooking and heating stoves, gas-meters, and gas-lights; various kinds of electric lighting apparatus, including gas tar products; shale oil and gasoline machines, &c., and to some of the most important of the exhibits, as well as to the exhibition generally, reference is made in another column.

The Lord Provost, in opening the proceedings, said that during the last two or three years Glasgow had been held many exhibitions of a character more or less similar to the one which it was his duty to open. The first of them was held at South Shields in the year 1877, and was a very great success. That exhibition was attended by upwards of 30,000 persons during the five days that it was open. Since then there had been others, attended with more or less success, many large towns throughout the kingdom; two in Scotland—Greenock and Paisley—and recently two in Ireland—Belfast and Dublin. Until the present exhibition was projected there had never been any attempt made to diverge from the original idea of a display of gas apparatus; indeed, all exhibitions such as were arranged up to the present have been little more than collections of gas apparatus pure and simple. The Council of the Philosophical Society of Glasgow, however, might be said to have originated this exhibition, with the fixed determination to make it not only a gas apparatus exhibition, but an attempt to show to the fullest advantage everything that could be connected with the exhibition of electric lighting, gas cooking, heating, cooking, and as a motive power; and to combine along with it an effort to show how far electricity, more especially as a lighting agent, generally had been utilized, or was in the way of being utilized. Hitherto no such effort had been made to put electricity and gas on a footing with each other, and doubtless they might say that the same exhibition, so that inventors connected with them might have an opportunity of showing how far they had progressed in their inventive efforts. The exhibition, however, included several other departments or sections, in each of which there was a most elaborate and extensive display of valuable articles, and doubtless they might say that the exhibition was one for dealing with lighting and heating appliances. The Committee were in hopes that before the exhibition closed they would have the gratification of bringing under the notice of the Glasgow people several things of very great interest, both from a practical and from a scientific point of view, connected with electric lighting, and that this system of illumination might be thoroughly put upon its trial. The Committee some time ago resolved to appoint a Committee of Jurors, consisting of scientific experts, to report upon the various exhibits connected with electric lighting, and it was the aim of the Executive Committee that the trials should be a most extensive and carefully instituted investigation. As the result of efforts in other directions in connection with lighting, he asked those present upon that and other occasions when they might visit the hall, to look around, and they would find very many successful efforts in connection with other kinds of apparatus dealing with coal gas apart from lighting. It was authorized to say by members of the Committee, as well as by exhibitors of great and varied experience, that as a gas apparatus exhibition alone the undertaking had certainly never been equalled. And when they passed to coal gas as a motive power, he thought he was justified in saying that at no former exhibition of the kind had there been such a display of engines driven by that agent. In many parts of the exhibition there were exceedingly interesting exhibits supplying much matter to occupy the thought of both practical and scientific people. This was especially true of several collections of specimens connected with the treatment of coal tar, and which had resulted eventually in the production of the most valuable and colorful products ever produced, and rivaling anything which Nature brings forth. The coal tar dyes were now very numerous, and their manufacture had become an immense industry both in this country and upon the Continent. Then, also, there were the products resulting from the distillation of shale, which were specially illustrated by Young's Paraffin Light Company.

Dr. FROST then referred at some length to the first exhibition of gas apparatus ever held in Glasgow—in 1846-47. He next touched upon the early history of gas, and afterwards described Professor Graham Bell's phonograph—the latest use to which it was proposed to put. Mr. DICK, on behalf of the Executive Committee, mentioned that it had been arranged, with the concurrence of the University authorities, to exhibit four electric lights on the central tower of the University buildings. The electricity would be supplied from an engine driven in the exhibition, and the height at which it was proposed to expose the lights was the greatest that had ever yet been attempted for the purpose.

Sir J. WATSON proposed a vote of thanks to the Town Council for their kindness in providing the supply of gas necessary for the purposes of the exhibition. In every respect the exhibition was a very complete one, and he trusted it would be of great advantage to the city, not only by way of giving knowledge and information, but also in stimulating inventive ingenuity.

Mr. WALLS briefly replied, and the proceedings terminated with a vote of thanks to the Lord Provost for presiding.

SALE OF GAS SHARES AT WAKEFIELD.—On Friday last Messrs. Howgate and Chapman offered for sale, by auction, 50 £10 shares (£4 paid) in the Wakefield Gas Company, which were afterwards sold to the Messrs. Howgate and Chapman, who had ever yet been shown in the Rothwell Gas Company were sold at the rate of £6 1s., 15s. 7s. 6d., and £5 17s. each.

COMMERCIAL GAS COMPANY.

The Half Yearly General Meeting of this Company was held at the City Terminus Hotel, Cannon Street, E.C., last Friday—RICHARD BRADSHAW, Esq., in the chair.

The Secretary (Mr. H. D. Ellis) having read the notice convening the meeting, the Chairman affixed the seal to the register of Shareholders, and the minutes of the last general meeting were read and confirmed.

The following report and accounts were then taken as read:—
The Directors submit the accounts for the half year ended June 30, 1880.

The revenue account shows a net profit for the half year of £49,358 8s. 5d., deducting therefrom £1875 for interest on debenture stock, there remains the sum of £47,483 8s. 5d., of which, having regard to the sliding scale and the price of gas charged during the half year, the sum of £54,000 is available for dividend. The Directors recommend the payment thereof at the rate of £11 5s. per cent. per annum upon the old stock of the Company, and of £5 5s. per cent. per annum upon the new stock, both less income-tax, and that the balance be carried to the reserve-fund.

A resolution will be submitted to the Proprietors, authorizing the Directors to make suitable arrangements for the retirement of Mr. Robert Jones, the Company's Senior Engineer, who has during the past 20 years rendered most important services to the Company.

No. 1.—STATEMENT OF CAPITAL (Stock) on June 30, 1880.

Acts of Parliament relating to the Raising of Capital.	Dividend Authorized with Gas at an Initial Value of 3s. 9d.	Paid up.	Remaining to be Paid up and Unissued.	Total Amount Authorized.
		£ s. d.	£ s. d.	£ s. d.
Commercial Gas Act, 13 & 16 Vict., cap. 135	10 per cent.	450,000 0 0	..	450,000 0 0
Ratcliff Gas Act, 18 Vict., cap. 12	Ditto.	100,000 0 0	..	100,000 0 0
Commercial Gas Act, 38 & 39 Vict., cap. 200	7 per cent.	105,180 13 6	174,819 6 6	280,000 0 0
		655,180 13 6	174,819 6 6	830,000 0 0

No. 2.—STATEMENT OF LOAN CAPITAL on June 30, 1880.

Acts of Parliament Authorizing the Loan Capital.	Description of Loan.	Rate per Cent. of Interest.	Total Amount Borrowed.	Remaining to be Borrowed.	Total Amt. Authorized.
Ratcliff Gas Act, 18 Vict., cap. 12	{ Mortgage } { or Bond }	{ 5 per cent. }	..	£20,000	£20,000
Commercial Gas Act, 38 & 39 Vict., cap. 200	{ Debenture } { stock }	{ 4½ per cent. }	£70,000	210,000*	280,000
* At interest not exceeding 5 per cent.			£70,000	£250,000	£300,000
Total share capital paid up (see No. 1)			£655,180 13 6		
Total loan capital borrowed (see No. 2)			70,000 0 0		
				£725,180 13 6	

No. 3.—CAPITAL ACCOUNT.

Dr.	Cr.
Expenditure.	
To Expenditure as on June 30, 1880	£667,630 16 7
Balance	51,529 16 11
	£725,180 13 6

	Certified Receipts to Dec. 31, 1879.	Received during the Half Year.	Total to June 30, 1880.
By Stock	£350,000 0 0		£350,000 0 0
New stock	70,000 0 0	£35,180 13 6	105,180 13 6
Debenture stock	..	..	70,000 0 0
	£690,000 0 0	£35,180 13 6	£725,180 13 6

No. 4.—REVENUE ACCOUNT, for the Half Year ended June 30, 1880.

To Manufacture of gas—	
Coals, including dues, carriage, unloading, and trimming (see account No. 8)	£35,170 13 10
Salaries of Engineers, Superintendents, and other Officers at works	3,019 19 6
Wages (carbonizing)	12,935 1 5
Purification, including £1465 19s. 2d. for labour	5,627 15 6
Repairs and maintenance of plants and works, materials, and labour (less £102 received for old materials)	10,119 8 5
	£83,872 18 8
Distribution of gas—	
Salaries and wages of Officers (including Rental Clerks)	£2,463 14 6
Repairs, maintenance, and renewals of mains and service-pipes, including labour	5,169 19 8
Repairs and renewals of meters	1,783 5 1
	9,416 19 3
Public lamps—	
Lighting and repairing	5,090 13 7
Rent, rates, and taxes	3,533 5 3
Management—	
Company's Auditors	£1,250 0 0
Directors' allowance	75 0 0
Salaries of Secretary, Accountant, and Clerks	725 3 2
Collectors' commission	1,480 5 0
Stationery and printing	652 8 5
General charges	309 14 9
	4,902 11 4
Bad debts	392 0 6
Law charges	2 15 4
Superannuations	233 6 8
Official officers	68 1 3
Interest	19 15 9
	£104,822 7 7
Balance carried to profit and loss, net revenue account (No. 5)	48,338 8 5
	£153,180 16 0

By Sale of gas—	
Common gas, per meter, at 3s. 3d. per 1000 cubic feet	£103,489 15 7
Public lighting and under contracts, common gas (see statement No. 9)	10,451 12 10
	£113,941 8 5
Meter-rental	2,153 7 3
Residual products—	
Coke, less £1049 17s. 11d. for labour	£17,514 6 5
Breeze, less £114 4s. 1d. for labour	323 7 0
Tar	7,943 1 5
Ammoniacal liquor	9,251 16 1
	35,012 10 11
Rents	63 9 5

No. 5.—PROFIT AND LOSS (Net Revenue Account).

Interest on debenture stock	£1,575 0 0	Balance, Dec. 31, 1879	£63,550 14 2
Balance available for dividend carried to balance-sheet	69,923 2 7	Less amount available for dividend, to Dec. 31, 1879, and paid	£34,600 0 0
		Insurance-fund	6,300 0 0
			40,800 0 0
			£23,139 14 2
		Balance from revenue account (No. 4)	48,338 8 5
			£71,498 2 7

No. 6.—RESERVE-FUND.

Balance on June 30, 1880	£32,208 18 0	Balance on Dec. 31, 1879	£30,944 3 7
		Dividend received	489 14 5
		Balance of amount available for dividend	775 0 0
			£32,208 18 0

No. 7.—INSURANCE-FUND.

Balance on June 30, 1880	£15,881 9 11	Balance on Dec. 31, 1879	£9,347 11 1
		Dividends received	333 18 10
		Amount transferred from net revenue account	6,200 0 0
			£15,881 9 11

No. 8.—STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1879.	Received during the Half Year.	Carbonized during the Half Year.	In Store, June 30, 1880.
	Tons.	Tons.	Tons.	Tons.
Common	69,224 13 1	69,256 13 1	13,123	1,915
Cannel	1,449	5,388 1 2	4,922 1 2	
	14,304	74,913	74,179	15,038

No. 9.—STATEMENT OF RESIDUAL PRODUCTS.

	In Store, Dec. 31, 1879.	Made during the Half Year.	Used during the Half Year.	Sold during the Half Year.	In Store, June 30, 1880.
Coke—Chaldrons of 36 bushels	4,633	97,081	31,061	65,731	1,942
Breeze do.	2,520	9,450	..	11,305	765
Tar .. gallons.	145,600	810,034	..	834,018	121,586
Ammon. liq.—Butts of 108 galls.	1,429	27,660	..	26,938	2,151

* Under "Weights and Measures Act, 1878."

No. 10.—STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity Made, Meter Register.	QUANTITY SOLD.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lights.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
Common	Thousands. 771,613	Thousands. 30,867	Thousands. 649,168	Thousands. 706,065	Thousands. 8,487	Thousands. 706,522	Thousands. 63,091	4,886

the meetings from time to time encouraged them upon all occasions, but more especially when they had to meet greater difficulties than usual. Before he resumed his seat he must offer to the Chairman and the Board his sincere thanks for the manner in which they had spoken of his long services to the Company, and it would be ungrateful of him to neglect to do so. He was very anxious to render them as their Engineer, because from the time he joined the Company up to the present he had had nothing but their approbation, and they had at all times strengthened his hands to do what he had been enabled to do for the Company. Many of the Shareholders were present, and he was very much concerned to see six years younger than he (the speaker) was when he entered it, and it was a very great pleasure to him to be able to say of him that he had made the study of gas and civil engineering his great pleasure, and had received the highest distinction in the profession. He then said that he was very glad to see before him the Shareholders for the very unanimous manner in which they had accepted the resolution enabling and empowering the Board to deal with him. It was what he had expected, and he was not disappointed. He thanked them as heartily as he could, and then he said that he was very glad to see before him the Board, and he thanked them for the manner in which they had received his resignation.

The proceedings then terminated.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE
COMPANY.

The following report and accounts of this Company for the half year ending June 30 last were submitted to the Proprietors at the Annual General Meeting, held on the 25th ult. :—

The Directors have pleasure in presenting the accompanying statement of accounts, by which it will be seen that the Company's business is steadily increasing. The amount to the credit of profit and loss account is £4856 18s. 9d., from which the Directors recommend the declaration of the statutory dividends at the rate of 10 per cent. on original, and 7 per cent. on new ordinary capital for the half year (free of income-tax), which will absorb the sum of £3634 7s. 2d.

After payment of the dividends, the balance will be £1222 11s. 7d. From this amount the Directors have deducted the sum of £884 16s. 2d., and added thereto the dividend accrued on the present reserve, amounting to £115 3s. 10d., making together the sum of £1000, which has been invested in Consols, thus increasing the reserve to £5000, leaving the balance of £337 15s. 5d. to be carried forward.

The Directors have, as intimated in their previous report, made a call of £2 per share paid on the 1st of June last, and have since made a further call of £2 due on the 1st of October, thus completing the first series issued of new ordinary shares. This will enable the Directors to meet the increasing requirements of the district for the present.

The favourable results, as shown by the balance-sheet, have enabled the Directors to give notice of a reduction in the price of gas supplied by meter, from and after Jan. 1, 1881, from 4s. 3d. to 4s. per 1000 cubic feet.

The Engineer reports that the works are in very efficient condition, and quite equal to the requirements of the coming winter.

The laying of the new trunk mains has progressed satisfactorily; a short section only remains to be laid, which it is hoped will be completed in about a month from the present time.

At this meeting two Directors retire by rotation—namely, Messrs. Gripper and Malcolm—and one Auditor, Mr. Alexander Nicol; all of whom are eligible for re-election, and offer themselves accordingly.

Dr.	Revenue Account, for the Half Year ended June 30, 1880.	Cr.
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Cools, including carriage, &c.	£5,648 0 3	Sale of gas—	
Purifying materials and sundries	866 13 11	52,577.60 cubic ft. at 3d.	
Salaries of Engineers	250 0 0	per 1000 feet,	
Wages, &c., at works	1,267 0 2	less discounts	£1,139 12 5
Repairs and maintenance of mains and plant, less one material sold	827 1 1	Public lighting and candles	
Salaries of Inspectors and Clerk	183 3 0	contract . . .	£1,548 7 10
Repair and maintenance of mains and service pipes	602 18 0	Rental of meters . . .	£12,688 9 11
Rebuilding, renewing, and repairing meters	173 1 10		454 13 5
Lighting and repairing public lamps	328 14 1		£13,143 3 4
Rent of siding	27 10 0	Residual products—	
Rates and taxes	375 0 0	15s. lid. for labour and cartage	£1,600 18 0
Directors allowances	375 0 0	Breeze	96 2 0
Salaries of Secretary and Clerks	291 5 5	Tar	650 17 10
Collectors commission . . .	294 5 2	Ammonia and liquor, less £288 15s. odd. for acid	753 4 8
Stationery and printing . . .	61 7 9	Transfer fees	3,311 3 10
General establishment charges and incidentals	142 3 4		
Auditors	35 0 0		
Insurance	8 10 0		
Bad debts	104 3 4		
Total expenditure	£211,743 19 10		
Balance	4,533 16 5		
	£216,277 16 5		£16,277 10

SEWER VENTILATION BY STREET LAMP-PILLARS.—DR. C. B. Fitzgerald, writing to *The Times* last week on "Sewer Ventilation," says that as sewers are at present ventilated—that is, by means of gratings at certain intervals in the streets—the public run considerable risk of being infected by the effluvia which escape from the sewerage system. He suggests that the ventilation of the sewerage system might be obtained in an efficient manner by a method so simple and inexpensive that he is surprised it has not already been put into practice. His plan is "to connect the upper part of the main sewer, at short intervals, with the street by means of a vertical pipe leading to a small lamp-chimney. The heat of the flame would create a partial vacuum, by means of which the sewer gas would be drawn upwards and partially consumed by the burner, partly discharged harmlessly into the air, high above the heads of the passers-by. A fan gulf above this pipe is not perfect, and is open to the objection of being liable to be blown away, and is far preferable to the present plan of ventilating through open gratings."

BREITENEGG GAS COMPANY.—The report of the Directors of this Company for the half year ending June 30 last, stated that since the date of the last report the alterations, additions, and repairs therein referred to had been nearly completed. Provision for increased storage at the works having been made by the purchase of land and erection of tanks, which had already been prepared, and the Directors intended to ask for tenders. The cost of the extension was expected to be £11,000, and to meet this expenditure the unpaid balance on the last issue of shares had been called up. The Directors also proposed to make provision to meet the probable increase in price of gas, to take effect from the 1st of August, and they recommended a dividend at the rate of 10 per cent. per annum, with bonus. The profits and loss account showed that in the six months reported upon £897 had been received from sales of gas, less expenses of £600, leaving a profit of £297 brought forward, £150; had debts recovered, 11s. 6d.—total, £418. There was expended in the manufacture and distribution of gas and management, £362; rates and taxes, £31; interest and discount, £164. These sums, added to the debit of £1,000 on the opening balance sheet, gave a total expense, made a total of £629, leaving a balance of £3018.

ALLIANCE AND DUBLIN CONSUMERS GAS COMPANY

The Half-Yearly General Meeting of this Company was held on Thursday last—E. FOTTELL, Esq., J.P., in the chair.

The SECRETARY and MANAGER (Mr. W. F. Cotton) read the Director report as follows :—

In presenting this report, to which is annexed the statement of accounts, the Directors have to express their congratulations at the continued prosperity of the Company.

After deducting the interest upon bonds and debenture stock, &c., the amount standing to the credit of the profit and loss account for the half year is £35,352 18s. 9d. out of which the Directors recommend the payment of dividend at the rate of 10 per cent. per annum, free of income-tax.

The payment of dividend will absorb a sum of £29,500, leaving a balance of £585 18s. 9d., which, with the balance brought forward from last account, makes a sum of £51,467 2s. 6d. to be carried to the credit of the next account.

Since the last account was rendered to the Shareholders, a sum of £26,300 has been issued in debenture stock, bearing interest at the rate of 4 per cent. per annum. This stock has been issued in lieu of bonds which fell due, and upon which interest was paid at the rate of 4½ per cent. per annum.

During the period to which this report refers, the works and plant of the Company have been well maintained, and are in excellent order.

Dr.—Capital Account, for the Half Year ended June 30, 1880.

	Expended this Half Year	Total to June 30, 1880.
Expenditure to Dec. 31, 1879	..	\$735,742 13 3
Expenditure on manufacturing plant, machines, storage works, and other structures connected with manufac- ture (not in place of old ones), and new mains and service-pipes (not being in place of old ones), including laying same, paving, and other works connected with distribution	\$785 0 2 973 18 6 222 3 10	
New meters (not in place of old ones), including fixings, &c. Horses, carts, &c.		2,011 2
Total expenditure		\$737,735 15 1
Balance of capital account	..	7,888 14
		\$745,624 10

CR.—Capital Account.

	Certified Receipts to Dec. 31, 1879.	Received during Half Year.	Total Receipts to June 30, 1880
Share capital	\$589,944 10 0	£7,698 0 0	\$597,642 10
Bonds and debenture stock	147,500 0 0	..	147,500 0
	£737,444 10 0	£7,698 0 0	\$745,142 10

Dr.—Revenue Account

To Manufacture of gas—		
Coals, including dues, carriage, unloading, and all expenses of depositing same on works	£40,335	11 6
Purifying materials, oil, water, and sundries at works	602	5 0
Salaries of Engineers, including Chief Engineer, Superintendents, and Officers at works.	1,630	1 2
Wages at works.	7,647	5 10
Repairs and maintenance of works and plant (including renewal of retorts, machines, apparatus, tools, materials, and labour	8,698	8 0
	<u>£64,212</u>	<u>11 6</u>
Less old materials sold	23	12 6
		<u>£64,678 12 0</u>
Distribution of gas—		
Salaries of Surveyor, Chief Inspector, Inspectors, Assistant Inspectors, and Clerks in Light Office	£1,238	10 0
Repair, maintenance, and renewal of mains and of service-pipe, including materials, laying and paving, and labour	2,031	14 11
Repairing, renewing, and refixing meters.	1,635	13 10
		<u>4,905 18 9</u>
Public lamps—		
Lighting and repairing		<u>419 9 7</u>
Rents, rates, and taxes—		
Rents	£686	12 7
Rates and taxes.	1,875	1 1
		<u>2,561 13 8</u>
Management—		
Directors' allowances	£650	0 0
Salaries of Secretary, Accountant, Clerks, Office-keepers, and Messengers	1,233	6 0
Collectors' commission	1,585	16 2
Stationery and printing	180	10 4
General establishment charges and incidentals	935	5 8
Company's Auditors	30	0 0
		<u>5,045 15 4</u>
Law and parliamentary charges		<u>176 7 1</u>
Bad debts		<u>607 8</u>
Abatement and allowances, &c.		<u>1,745 16 8</u>
Annuity account		<u>500 0</u>
Total expenditure		<u>£80,043 13 8</u>
Balance carried to profit and loss account		<u>85,927 15 6</u>
		<u>£118,971 19 4</u>

Ср.—Revenue Account.

By Sale of gas—		
\$10,162.50 cubic feet, at 4s. 3d., 4s. 6d.,		
and 4s. 3s. per 1000 cubic feet	\$89,556 19 11	
Public lighting and under contracts	4,488 16 6	
		\$94,046 16
Rental of meters		2,654 17 14
		\$96,695 14
Residual products—		
Coke, &c., less labour and cartage	\$12,866 8 2	
Freight	603 5 5	
Tar	4,910 17 5	
Ammoniacal liquor	2,714 14 6	
		\$21,095 5
Receipts		206 11
Transfer fees		48 10
Disposal, money received		925 6 1
		\$118,971 8

The CHAIRMAN, in moving the adoption of the report, said: In putting this resolution to you, I have merely to call your attention to one or two matters. One of them is the rather significant fact that in comparison with the corresponding period this time twelvemonths our gas receipts are less by the amount of £2248. What this may be attributed to it is hard to define, but my own idea is that we had brighter weather in the past half

year than during the corresponding period last year, and thus the consumption of gas was lessened; but I think it is also attributable to another fact—namely, that the consumers, after the severe lectures they have had here and elsewhere, have been more careful in the use of their gas, and by proper burners have obtained the same light as before at less cost. I think this is just and right, and I believe it is a thing that will tend to a greater consumption of gas. People were always saying, "But gas bill is increased," and I always replied, "If it is your own fault, as you have not burned it properly," and I thoroughly believe it is right to encourage all consumers to have proper fittings, so as to get the best value they can for their money. Our residuals are also less by £1683. The loss, of course, from not having carbonized the same quantity of coal, because we have consumed less coal by 3000 tons at the less cost of £7900 for coal. This results from our having had very good contracts, and having these contracts enables us to show a profit of £4300 in excess of this time twelvemonths. I think you will say that this is a very satisfactory statement of accounts to exhibit. We are now in a new era of gas supply, and we are beginning the 3s. 11d. charge, and we hope that at this price the consumption of gas will increase, for I invariably find that whenever a reduction takes place people become a little more lavish, and spend more. We do not want waste of gas, but we want consumption. To add to the legitimate consumption, we have, and I may say, inaugurated a latent exhibit of this apparatus here in Dublin. That exhibition was most successful, and the results are already beginning to be felt. As I have stated before, we have opened a small showroom, where we exhibit different classes of stoves and burners. These we have determined to let out on hire at a rental. We do not mean to interfere with the business of the Proprietors. We allow persons who wish to buy apparatus to go and purchase them from the proper people; but we conceive it to be your interest that we should have these articles here, and that consumers should know where they can get them on hire. With this view we are determined to push as far as we can the legitimate use of gas. The exhibition turned out very well, the attendance being very enormous, and already several stoves have been hired and several others bought. We have during the last half year changed £23,000 of our debenture stock from 4½ into 4 per cent. stock, thereby lessening the cost, and showing that your stock is held in proper estimation. We have issued new capital of £7698, and this amount appears in the accounts for the half year I am alluding to. The balance of £10,000 does not appear in that account, and will have to wait for the next, because the persons to whom that sum was appropriated were those entitled to have the shares *pro rata*, and the rest was absorbed by applications from various people—old Proprietors, however, getting the preference—so that in this account we have only to deal with £7698 of new capital. On that new capital you are aware £2 was called up at once, and we propose making another call on it that would be due on the last day of December, thus keeping the amounts straight from half year to half year, and making £4 per share. The Proprietors will be entitled to the allocated dividend. This £7698 is placed to capital account; and if we had not received this additional capital at the time we did, the balance would appear on the wrong side. We had money enough to carry on with the hanging balance, but that balance we are now going to have, and we have power, and are in fact, ordered by the Court of Bankruptcy to do. We have already made a beginning by investing some of it in bonds. Therefore it will give a stability to the Company which will keep it straight for any contingency that may occur.

Mr. D. DRIMMID seconded the resolution, which was carried unanimously. The CASHIER next moved that a dividend at the rate of 10 per cent. per annum be declared, free of income-tax.

Mr. TAILOR seconded the motion, and it was agreed to unanimously. Alderman TARBEE, J.P., having been called to the second chair.

Mr. VANCE, J.P., moved a vote of thanks to the Chairman and Directors. The statements of accounts and the remarks of the Chairman testified, he said, to the prosperity of the concern, and the feelings of the outside public showed the affairs of the Company were admirably conducted.

Mr. BUKER seconded the resolution, which was passed unanimously.

Mr. E. FOTTELL thanked the Shareholders for their uniform kindness towards him as Chairman of the Board, and expressed a hope that his colleagues and himself would continue to deserve the confidence of the Proprietors.

Mr. BRUNKER said, as Auditor of the Company, he had had the opportunity of investigating thoroughly the affairs of the concern, and seeing practically how they were carried on. With this knowledge thus personally acquired, he felt it a privilege to propose a vote of thanks to Mr. E. Cotton, the Manager and Secretary of the Company, for the very able manner in which he fulfilled the important duties of his responsible office. He (Mr. Brunker) moved, with the permission of the Shareholders, included in the report of the staff of the Company.

Mr. CHEZ seconded the motion. Recently he had had an opportunity of expressing his high opinion of Mr. Cotton's abilities, and the extreme diligence with which he conducted the operations of the Company. He was glad that the Directors had shown the people of Dublin that there was an ample field for the use of gas besides the lighting of dwelling-houses. There was one other point he would mention for the satisfaction of the Proprietors. It would be very satisfactory if the decrease in the consumption of gas during the past half year was due, as the Chairman stated, to the lessened amount of waste by consumers. Such a fact enabled the Company to deal with greater confidence towards the public, because it showed that complaints ceased when the consumers better understood the means to prevent waste, which he believed took place in many houses in Dublin.

Alderman TARBEE said, before putting the resolution, in which he fully concurred, he would refer to a fact that showed conclusively the good management of Mr. Cotton and the staff which he directed. The fact was this, that, though the consumption of gas during the past half year was less than during the corresponding period of last year, the profit was more than £2000 higher. This happy result was due to the great care and watchfulness of Mr. Cotton, aided by the other officials. He might add that this was clearly shown in the quantity of gas consumed and that it did not interfere with the Company's prosperity. The Shareholders were secure of their 10 per cent., with a good balance over.

The motion was unanimously agreed to.

Mr. COTTON, in returning thanks, said he was very grateful to the members for the remarks and the vote of thanks, and he was glad to hear them assure them that no effort would be spared to keep his own part and that of the staff to retain the future good opinion of the Shareholders.

The proceedings then terminated.

THE PUBLIC LIGHTING OF WYNDHAM.—On the night of Saturday, the 25th ult., the streets of Wyndham were again illuminated with gas, after having for the past three years been lighted with oil. General satisfaction appears to be expressed at the improvement thus effected in the public lighting, especially on the main road to the railway station, where the gas is fairly lighted, and shows that the same of light he continued it will add much to the comfort of visitors and residents, all of whom are to be congratulated on a change which cannot but be for the general good.

SHEFFIELD UNITED GAS COMPANY.

The Fifty-first Ordinary General Meeting of this Company was held on Friday last—Mr. F. T. MARRIS, M.P., in the chair.

The following report and accounts were presented:—

On reference to the accounts which the Board have now to submit, it will be seen that the earnings for the half year ending the 30th of June last are less than the maximum authorized dividend for that period by the sum of £3883 14s. 7½d., being the difference between the balance brought over from the preceding account (which was £17,737 5s. 1½d.), and that carried forward at the end of the half year (which was £15,051 10s. 6½d.). That there would be a deficiency was anticipated by your Directors when they decided upon the reduction in the Company's charges, made in the autumn of last year, but the actual amount of the deficiency is not greater than your Board then contemplated it probably would be.

The Company's result for the year ending 30th June last, it did in the balance-sheet submitted to the Shareholders in April last—namely, at £67,035 1s., and your Directors consider, as they trust you also will, that the accounts now presented are of a most satisfactory character.

Your Directors have the pleasure to recommend that there be paid for the past half year a dividend after the rate of 10 per cent. per annum on all the paid-up capital. Such dividend will be as under, viz:—

On £135,000 class A stock	£6,750 0 0
On £209,053 10s. class B stock	10,452 13 6
On £99,700 class C stock	4,985 0 0
On 11,587 new ordinary £10 shares (second issue), £4 per share paid up, being 4s. 8d. per share	2,587 8 0
On 11,442 £2 10s. each, £2 per share paid up, being 2s. per share, or	1,146 4 0
	£23,921 5 6

Of the £2 10s. shares 517 were not taken up by the Shareholders to whom the same were offered; and as the Companies Clauses Act, 1863 (which applies to them) provides that the Company may dispose of them in such manner as the Directors think most advantageous to the Company, your Board will shortly put them for sale by public auction.

Your Directors are glad to find that the application of gas for cooking purposes, to which the public attention has lately been much directed, is steadily on the increase.

The additional works in course of construction at Effingham Street are in such a state that the intended large gasholder there will, your Board anticipate, be ready for use by the commencement of the forthcoming year.

The three elected Directors who now retire by rotation all offer themselves for re-election. They are Mr. Mappin, Mr. Hutchinson, and Mr. Sorby.

Capital Account, June 30, 1880.

Class A stock, fully paid up	£135,000 0 0
Do. B do. do.	209,053 10 0
Do. C do. do.	99,700 0 0
11,587 new ordinary £10 shares (second issue), £4 per share paid up	21,748 0 0
11,442 £2 10s. shares, created May 6, 1878, £2 per share paid up	22,924 0 0
Amount raised on mortgage	218,000 0 0
Less paid off since	600 0 0
	£700,000 0 0
	£230,125 10 0

Expenditure.

Lands, buildings, parliamentary and other expenses, works, and machinery (including mains to June 30, 1880) to Dec 31, 1879	£403,668 14 2½
Less depreciation	1,928 0 5
Ditto, extensions to June 30, 1880	£401,740 13 9½
Mains from June 30, 1880, to Dec 31, 1879	£78,336 3 11
Less depreciation	482 0 1
Ditto, extensions to June 30, 1880	77,854 3 10
Meters to Dec 31, 1879	£30,648 3 11
Less depreciation	583 2 6
Ditto, extensions to June 30, 1880	30,265 1 11
Balance	740 17 0
	£15,477 11 4½
	£338,125 10 0

Revenue Account, for the Half Year ending June 30, 1880.

Balance brought from last account	£17,737 5 1½
Gas and meter rents	37,548 0 0
Coke, tar, ammonia water, and other residual products	21,160 18 0
Sulphate of ammonia, sale of gas-fittings, and work done (after deducting all charges), and house and other rents	3,602 11 0
Interest received from investments of the reserve fund	1,333 11 10
	£102,068 7 11½

Expenditure.

Production of gas	£60,964 7 9½
Mortgages interest, less received from Bankers and others	151 4 2
Balance	40,972 16 0
	£102,088 7 11½
Dividends payable Oct. 9, 1880	£23,921 5 6
Balance to be carried forward	£15,051 10 6½
	£40,972 16 0

General Balance.

Balance of revenue account, £40,972 16 0		Ledger balances, and accounts owing to the Company	£39,927 19 7
Ledger balance, and accounts owing by the Company	33,827 5 7½	Stores in hand	18,002 18 2
Balance of capital account	15,477 11 4½	Balance due from Bankers	32,343 2 5
	£90,277 13 0	Balance due from Cashier	1 12 10
			£90,277 13 0

Reserve-fund, invested Dec. 31, 1879 £67,035 1 0

The CHAIRMAN, in moving the adoption of the report, said the Shareholders would observe in the balance-sheet that the working for the half year required showed a deficiency of £2885 14s. 7½d. with regard to the sum required to pay their full dividend, and the Shareholders must bear in mind that the Company were now selling gas at 3d. per 1000 cubic feet less than in the corresponding period of last year. When the Directors made this reduction they were fully aware that there would be a deficiency, but the increased consumption of gas had enabled them to bring it down to the actual deficiency mentioned. These figures are of an exceptional character, and he believed but for them the Company would have been enabled to pay their full dividend, without taking anything from the balance, even at the present low price of gas, which now ranged from 2s. to 2s. 4d. The Directors had expended more by £2084 in repairs and carriage during the half year, and the repair of rotors was also a very large item, showing an increase over the corresponding period of last year of £4388. They had, further, the misfortune to have a coke shed fall down, and its re-erection involved

an expenditure of £1288, which had come out of revenue. Then, again, in consequence of the sinking of the ground at Grimsthorpe, through the working of coal there, they had been obliged to reconstruct a sewer which had become quite useless, and this had cost £745. Another item of additional expenditure was £315 for alteration of scrubbers. The local rates were also a large item of increase—£874 in the half year—and there had been received £4529 less for gas in the same period; thus, with the items of additional expenditure he had mentioned, making total of £14,178 against the Company. Turning to the favourable side of the half year's accounts, the Company had received more for coke by £1807, and for tar by £1735; and the interest on the reserve-fund amounted to £1333. Had it not been for the exceptional items to which he had alluded, and which had to be met out of revenue, the Company would have been in a very good position. The Shareholders would find that the quality of the gas had not been decreased. Mr. Wilkinson, the Corporation official, who tested the gas, reported that the average illuminating power had been 16.63 candles; but if it had been tested by the Sugg burner, which most of the other gas companies in the country used, the power would have been shown to be 18.18 candles. When Mr. Hobson occupied the chair at the meeting in October last he said that the construction of the new gasholder in Edinburg Street was going on favourably. Since then, however, the Directors had had considerable difficulty with it, from one cause or another, but now all was going on to the satisfaction of the Engineer and the Board. He observed in one of the papers read before the Chemical Section of the British Association, that a Committee had some time since been appointed to make a report on the best means of developing the light obtained from coal gas. That report, the concluding portion of which had been presented on the 14th of the present month, he believed to be of great value, and showed clearly how necessary it was for those who consumed gas to look after their burners and fittings. It was as important for them to do this as it was for those who manufactured the gas to see to its standard power. The Committee he referred to showed in tabular form a comparison of burners in use at the present time, classified according to the pressure applied, and they distinctly proved that after a certain high pressure was reached, the more gas was sent through them the less was the light obtained. Consumers should therefore see that they did not have too much pressure upon their burners, and they could only do this by the aid of governors. These were supplied by the Company and others, and could be fitted to each of the burners in a room. In addition to these regulators the character of the globes was also worthy of consideration. The public would find that the wider the openings were at the bottom, the better would be the light obtained. By attending to these two particulars, it appeared that people who had directed attention to these matters could get a maximum amount of light for the smallest consumption of gas. Since the Shareholders had last met, proof had been given that all gas companies, however well managed, were liable to accidents, and it was therefore important that they should have reserve-funds to meet the additional expenditure the accidents involved. He referred to the accident which occurred to one of the mains of The Gaslight and Coke Company in London. It was no doubt a very serious matter, but the Chairman of that Company told the Shareholders that their reserve-fund would enable them to pay all the damages for which they were liable without trenching upon the dividend. This he was sure, must be satisfactory, and he had no doubt that the accident which had occurred would cause those employed in laying gas-mains to realize the serious results which might attend any want of care on their part. There was one item in the accounts which appeared to him to be a very large one, and it was on the unfavourable side. He noticed that in Nottingham the rates for gas taxes paid by the Gas Company in twelve months amounted to £3734. Their capital was pretty much the same as that of the Sheffield Gas Company, but the amount paid in Sheffield last year for rates and taxes—not income-tax, but local rates—was £2986. He did not contend that they should pay in Sheffield the same amount as was paid in Nottingham, but he thought the nature of the rates paid by the Sheffield Company had been fully demonstrated that morning, before himself and his colleagues, by their having to sign a cheque for the district rate, amounting to £2920, and also one for £502, the amount of the Brigiside poor-rate. Whether or not the rates and taxes in Nottingham were more than in Sheffield, he thought Sheffield as they were in Nottingham, would be a difficult question for any one to answer; but certainly the Gas Company of Sheffield appeared to be very heavily burdened when they had to meet this amount of taxation. The only other matter he would allude to was that since they had last met he had seen the Engineer Knight, who had been at the house of the Directors had seen of this gentleman he (the Chairman) must say that they were very well satisfied with him, and he hoped he would remain with them, and give them the same satisfaction, as long as he was their servant, as he did at the present time.

Mr. J. Wilson seconded the motion. Referring to the Chairman's comparison between the rates of Sheffield and Nottingham, he pointed out that there was three times more piping at the former place than at the latter. He attended a meeting of the Assessment Committee the previous week, and the Gas and Water Companies were then spoken of as being too lightly rated. The Committee were, in fact, going to re-rate, for it was found that the amount of piping in Sheffield for the same length was paid. Turning to another matter, would the Chairman inform him whether the Directors were going to make any fresh calls?

The CHAIRMAN said possibly about the 1st of January next. The Directors would have to go to the oldest shares first. With reference to the pipes in Sheffield and Nottingham, he must differ from Mr. Wilson. He had no authority for saying that the pipes in Sheffield were more than in Nottingham. Mr. Wilson said that the pipes in Nottingham were more than in Sheffield. Where on the other, it appeared to him that the area of pipes there was should be larger than at Sheffield. He had no authority for what he was saying, but made the statement simply from his observation, knowing the facts as very well. At all events, their undertaking were conducted in a very heavily rated. The Company paid a large sum, and he hoped that under no possibility would it be increased.

The motion was then put and carried, and the usual resolution as to the payment of dividend was passed.

On the motion of Mr. T. WATERHOUSE, seconded by Mr. E. WILSON, Mr. F. T. MAPPIN, M.P., was unanimously re-elected a Director of the Company, and was also an other retiring Directors; and a vote of thanks was passed to the former gentleman.

The CHAIRMAN, in thanking the Shareholders for the compliment they had paid him, said he held to his opinion that the prospects of the Company were unpromising either by the electric or any other light. He had paid attention to the way in which the Company was managed, both in the office and at the Board, and the Shareholders might depend upon it that as long as the affairs of their undertaking were conducted in the way they had been and would be, their property was well secured to them. Although the Company were able to sell gas at a low price, he anticipated that as Sheffield progressed they would be able to reduce it still further.

The proceedings then terminated.

AUSTRALIAN GAS COMPANY, SYDNEY, NEW SOUTH WALES.

The Report of the Directors of this Company for the half year ended June 30, 1880 (the 89th half year), stated that the profits, after deducting for bad debts, interest on borrowed money, cost of repairs and renewals, deterioration of plant, working expenses, and all charges, amounted with the balance brought from last account (viz., £631 7s. 3d.) to £24,051 4s. 1d.; the Directors recommended a dividend for the six months of 7½ per cent., which would absorb £18,740 16s. 4d., and leave a surplus of £5610 7s. 9d., out of which it was proposed to place to the reserve-fund £3000, leaving a balance to carry forward of £2610 7s. 9d. The growing demands for gas requiring further additions to the Company's manufacturing and holding powers, the Directors had found it necessary to purchase the property adjoining the northern boundary of their head station, and the requisite plant would be immediately ordered from England. They had also determined upon supplying gas to Ashfield, Burwood, and the surrounding districts, and for this purpose they had purchased an additional site for works of considerable extent, and it was hoped that by next winter the works would be in full operation. The following is the

Not Revenue Account, for the Half Year ended June 30, 1880.

Dividend payable Jan. 30, 1880	£18,740 9 6	Balance at Dec. 31, 1879	£28,086 16 8
Reserve-fund	8,515	Profit brought forward	22,719 10 11
Balance to next account	24,251 4 1		
	£31,406 13 7		£31,406 13 7

Liabilities and Assets, June 30, 1880.

Sundry creditors—temporarily loans	£123,453 10 0	Fixed investment:—Land, buildings, and machinery at head station and the five out-stations (Haymarket, Woodgrove, Balmalm, Peterham, and Five Dock); main and service pipes laid, implements and furniture	£253,382 13 1
Suspense accounts	6,265 1 10	Floating investment:—Coals, residual products, and rats in store, metals, lumps, and pillars	39,034 14 3
Capital paid up	230,000 0 0	Sundry debtors	2,119 10 2
Reserve-fund	27,252 10 0	Suspense accounts	3,063 8 3
Reserve for replacement of meters	4,478 10 16	Cash	607 2 5
Waste of unclaimed	2,252 10 0		
Unappropriated profits	21,341 4 1		
	£437,437 11 2		£437,437 11 2

AUCKLAND (NEW ZEALAND) GAS COMPANY.

The Eighteenth Annual Meeting of this Company was held on Friday, July 30th, Mr. T. M. NEWMAN, in the chair. The SECRETARY (Mr. E. B. PARSONS) read the report of the Directors, as follows:—

The accounts for the last year, now laid before the Shareholders, show that very satisfactory progress is still being made in the Company's business.

The accounts for the year ended June 30, 1880, show a balance of £11,201 17s. 8d., which left a profit of £2377 3s. 3d. The Directors, therefore, propose to pay a dividend for the past six months, after the usual rate of 7½. per share, which with the interim dividend paid in January last will absorb the sum of £2123 3s. The Directors also propose to give the consumers the benefit of the Company's increased prosperity by a reduction in the price of gas. This reduction it is proposed shall take effect on all gas consumed after the meters are inspected in the middle of September.

During the past year additions have been made in the number of retorts, and a new gasholder, capable of containing 112,000 cubic feet, has been erected at Freeman's Bay. The number of gas consumers, besides public lamps, is now 1767, being an increase of 220 over the previous year. The length of street-mains laid during the past year amounted to 2500 yards only.

Messrs. Newman and Wilson, as Directors, and Messrs. Pearce and White, as Auditors, retire from office. They are eligible, and offer themselves for re-election.

Dr.	General Balance-Sheet, June 30, 1880.	Cn.	
Paid-up capital on 8717 shares at £3	£42,355 0 0	Expenditure on capital account—	
Premium on shares sold	5,183 18 8	Freehold and leasehold land, buildings, manufacturing and distributing plant and stock of mains, service-pipes, and materials unemployed	£60,806 15 1
Profit expended on permanent works	3,256 5 1		
	£33,793 3 9		
Amounts owing by the Company	472 4 7	Stock of coal and shale	994 2 9
Cash at call	3,470 0 0	residual products	972 0 0
Dividends unclaimed	9 15 0	gas-stoves	490 1 8
Balance at credit of reserve-fund	4,340 0 0	Cash in Bank of New Zealand	1,624 0 0
Profit and loss—balance at credit thereof	6,594 11 0	Amounts owing to the Company—	871 11 4
		Debitures, reserve-fund investment	3,000 0 0
	£68,921 14 4		£68,921 14 4

Profit and Loss Account, for the Year ended June 30, 1880.

Coals carbonized	£5,024 0 0	Gas sold	£17,557 8 1
Stokers wages	1,101 14 1	Residual products	2,046 9 9
Distribution of gas and meter inspection	174 19 4	Transfer fees	8 3 6
Water at works	72 0 6		
Insurance	8 17 6		
Wear and tear	836 11 0		
Purification of gas	115 0 0		
General expenses—			
Directors and Auditors	220 0 0		
Salaries	1,203 16 9		
Stationery, printing, &c.	212 7 1		
Petty cash	26 0 0		
Travel expenses	6 0 0		
At all events	203 8 6		
Rates and taxes	412 9 2		
Cost of fuel	36 0 0		
Survey fees	18 10 0		
Interest	396 19 3		
Bad debts	41 2 0		
Balance carried down	8,877 3 3		
	£10,582 0 11		£10,582 0 11
Balance at credit, June 30, 1879			£4,200 12 6
Balance brought down			8,377 3 3
			£12,737 16 0
Less dividend declared July, 1879, on 7871 shares, at 7½. per share			£2,951 12 6
Interim dividend, January, 1880, at do.			2,951 12 6
			£5,903 5 0
			£6,834 11 0

The CHAIRMAN moved, and Mr. J. NEWMAN seconded, the adoption of the Report and accounts.

Mr. B. IRELAND moved as an amendment that the dividend be 10s. per share, which he said the accounts showed the Company could pay.

After some discussion, the amendment was rejected.

The Chairman is referred to the proposed reduction in the price of gas, that considerable pressure had been brought to bear upon the Company in this matter. The reduction would probably take place in September, but the exact amount was not definitely fixed. The Directors saw their way clear to pay the Shareholders the usual dividend, even with gas at the reduced price, as there was a growing increase in the consumption, which would be accelerated by the contemplated reduction.

The retiring Directors and Auditors were then re-elected, and the proceedings closed with votes of thanks to the Chairman, Directors, and Officers of the Company.

RIO DE JANEIRO GAS COMPANY, LIMITED.

A circular letter, under date of the 22nd ult., has been addressed to the Shareholders of this Company by the Secretary (Mr. Thomas Dawson), setting forth the present position of the new contract between the Imperial Brazilian Government and the Company.

After stating that, as the result of prolonged negotiations, a new contract for the supply of gas to Rio was signed on the 21st of April last year, to replace the old one which expired on the 25th of the previous month, the letter states that this new contract required confirmation by the Brazilian Legislature, but the Board considered to continue the gas lighting upon the terms of this contract while awaiting its confirmation. The new contract had to be read three times, both in the House of Deputies and in the Senate. The first reading of 1879 it was read in the House of Deputies twice, and in the present session it came on for the third reading on the 24th of August, when Senhor Buarque de Macedo, the present Minister of Public Works, proposed certain modifications which were accepted by the House, and the project of law has been or will be soon approved by the Senate. The letter concludes: "The Board think it expedient here to abstain from remarking on the evident injustice which would be done to the Company if such a measure were carried into effect, for they trust that the enlightened wisdom of the Senate and Emperor will prevent their sanction being given to it. The Shareholders may rely on the best attention of the Board being given to the protection of their interests, and on receiving early information of any fresh incidents of importance that may present themselves."

The substituted Bill, containing the modifications above alluded to, provided for a revision of the contract made between the Company and the Government on the 21st of April, 1879. The following are the bases of the proposed revision:—

1. Reduction in the price of the cubic metre of gas.
2. Provision that at the termination of the contract all the Company's *matériel* shall belong to the State. This basis may be replaced by a reduction of the period of the contract.
3. Liability of the Company, without any further charge to the State, to substitute, already in the present contract, the electric light, or any other approved system which, upon arbitration, shall be considered for the substitution, shall only be carried into effect if the Government require it, giving at least three years previous notice, and the price of lighting being revised.
4. Subject to any agreement to the contrary, the liability for cost of lighting shall be solely at the charge of the consumer.

Upon the revision being made, it is provided that, without any additional liability upon the State or private persons, excepting such as already appears in the contract of April 21, the terms shall be considered as approved; but in default of an agreement being made with the Company, the Government may invite tenders for a new contract. In this case the Government are likewise authorized to indemnify the Company for the value of the *matériel* of lighting, in accordance with that to which they are lawfully entitled, and in accordance with the valuation already made, or which may be made by experts of the Government.

In case a new contract is not entered into, it is proposed to allow the Government to make any provisional arrangement with the Company "for the continuation of the service of the illumination of the city."

THE GAS APPARATUS AT THE MANCHESTER INDUSTRIAL EXHIBITION.

(FROM OUR OWN CORRESPONDENT.)

The Judges awarded to the section of the Manchester Industrial Exhibition devoted to gas appliances, made known on Friday, and prizes given consist of twelve silver and nineteen bronze medals, eight of the former and nine of the latter being awarded by the Gas Committee of the Manchester Corporation. Some of the more prominent exhibits in gas apparatus, so far as novelty is concerned, have already been noticed, but there are other exhibits also of considerable importance, and these can now be dealt with in a short sketch of some of the prize-winners.

Gas-cooking stoves, as I have already pointed out, have been the chief feature in this section. The exhibits have included all the best known as well as the most recent inventions in gas-stoves, and as no less than five silver medals have been awarded to this particular class of apparatus, this may, perhaps, be taken as an indication of the complete success with which gas is now, amongst manifold other uses, being applied to the purposes of cooking.

Amongst the gas stoves, we have already alluded to Messrs. Greene and Son's exhibit, to which has been awarded a Corporation silver medal, and to Messrs. Stark and Cox's Co.'s "Seavall" gas-cooking family stove, to which has been awarded a Corporation bronze medal. Messrs. Greene and Son have also taken a Corporation silver medal for their "Thermogene," or instantaneous water heater, which is a very ingenious apparatus for heating hot water for baths, kitchens, or for general use. The apparatus is very simple in its construction, consisting of a copper boiler, which requires no fixing, containing inside a coil of small piping, which in operation is brought in contact with a number of oxygenic gas-burners, and the water passing direct from the supply-pipe through the copper coil becomes heated at once, without coming in contact with the flame, and thus leaves the apparatus as pure as when it entered. A third silver medal has been awarded to Messrs. Greene and Son for a collection of Brünner's patent burners, and Messrs. Stark and Cox have also been awarded a bronze medal for McCormack's stocks and dies, wrench, and expanding taps for gas-pipes.

Of the other exhibits which have not yet been noticed, the most prominent are those shown by Messrs. Elliott, Alston, and Olney, of Manchester, who have taken one Corporation silver, and six Corporation bronze medals, and their stand contains perhaps the largest and most varied collection of gas-stoves ever shown. Messrs. Wright and Co.'s gas kitchen, for which they have been awarded the silver medal, contains several new improvements. The chief feature—and this is a principle of importance of which is now being generally recognized by gas-stove manufacturers—is that it is cased outside with a non-conducting material, which retains the heat of the stoves more effectually than where they are simply constructed of the ordinary iron casing, and consequently, ensures an economical use of the gas. The burners for boiling are also so arranged that toasting or grilling is effected by means of a fire-brick, in the place of the ordinary tin deflector. Bronze medals have been awarded to the following five other descriptions of gas stoves

exhibited by Messrs. Elliott, Alston, and Olney; Galli and Co.'s combined gas and coal kitchen range with gas oven; Billing and Co.'s £6 and £8 gas Sundial gas-cooking stoves; Galli and Co.'s atmospheric gas-cooking stove; and Wright and Co.'s cottage's gas-cooking stove. The same firm have also taken a bronze medal for a high-pressure copper tubular gas boiler, specially designed for heating greenhouses, which is simply a reproduction on a small scale of the ordinary multi-tubular boiler, with the exception that the boiler, instead of being heated by a coal furnace heated by means of a terra-cotta gas-burner, is perforated with small holes arranged on the atmospheric or Bunsen principle. The boiler is connected with the ordinary heating-pipes, and is sufficiently portable that it can be readily placed in any convenient corner, whilst the fire-place is also utilized for heating purposes. An improved apparatus for the purpose of heating a room, and which is also exhibited by the same firm. This is termed the asbestos gas-fire, and consists of a row of pipes with atmospheric gas-burners which can be fixed in any ordinary grate, and upon these are placed small blocks of asbestos, which on the gas being lit become red hot without consuming, and thus throw out a considerable heat with all the appearance of a coal fire.

Messrs. H. and C. Davis and Co., of London, have secured two silver and one bronze Corporation medal for gas stoves. The family gas kitchen, the chief feature in which is that it is entirely surrounded—back, front, sides, and top—with an effective non-conductor, and a Bellini's "Anchland" breakfast cooker with a kettle combined in a handy little stove—have secured the bronze medal.

Messrs. Beverley and Wyld, of Leeds, have obtained a silver medal for their family gas kitchen. This stove is fitted with a row of small glazed tiles or fire-bricks, bolted on a plate of iron arranged so as to retain the heat given out by the gas burnt, whilst to prevent radiation the tiles or bricks are backed by a patent non-conductor, known as "slag-wool."

Mr. T. Marsh, of Oldham, has received a silver medal for a useful new instrument which he exhibits for the first time. This is termed an "Erorometer," or gas-flow measure, and has been designed for testing instantly the quantity of gas passing per hour through burners, governors, &c. The instrument is intended to supersede the ordinary experimental meters, and is a small handy apparatus which can be readily applied wherever it is required. The instrument consists of a glass tube, with a glass rod, holding a perforated disc, running through the centre, and this disc is at once acted upon by the quantity of gas passing through the tube. Above the glass tube is a metal one constructed with great accuracy, and gradually widening out to the top; this contains a second disc, solid, and the higher this disc is forced up the tube the larger is the quantity of gas entering. The tube is graduated with a scale, and will measure from 1 to 10 feet per hour, but the results obtained were highly satisfactory, the quantity of gas passing through being indicated instantly, and there is no doubt it would be found very useful to gas managers for testing the consumption in street-lamps, &c.

Another very useful invention to which a silver medal has been awarded is Fisher's arrangement for lighting and ventilating public and private buildings by gas, which was exhibited by Mr. James Howarth, of Manchester. This arrangement consists of a sun burner, much of the ordinary description suspended from the ceiling of the room. The outer cone of the burner is perforated with holes communicating with a room passing through the ceiling and the roof of the building. Inside this disc is a copper tube resting upon the top of the burner or reflector. This tube collects the heat from the burner, and being closed at the top, the hot air is passed out through the perforations in the upper portion of the tube into the upper part of the room, thus creating a strong upward current of air, and thus effecting the ventilation. Several of these ventilators have already been applied with success to public buildings.

Silver medals were also awarded to the Lancashire Gas-Meter Company for their dry metallic governors (Boschold's patent) for street-lamps and domestic lights, which are already in use in the City of J. H. J. & Co., of Stockport, for the well-known "Boschold" gas-engine, and to Messrs. W. and B. Cowan, of Edinburgh, Manchester, and London, for Warner and Cowan's wet gas-meter.

Bronze medals were also awarded to the Lancashire Gas-Meter Company, for a "Boschold" gas-meter, to Messrs. J. H. J. & Co., for a "Boschold" self-acting gas-valve for the use of consumers; to Messrs. J. Wigglesworth and Son, for Gillingham's heat radiator; to Mr. John Busch, for Busch's well-known gas-governors; to Mr. Thomas Heron, for duplex gas-burners, globes, galleries, and coronets, complete; to the Patent Gaslight Company, for duplex gas-burners; to the Lancashire Gas-Meter Company, for a "Boschold" gas-engine; and to Mr. Thos. C. Marsh, for an equilibrium revolving governor for public lamps and chandeliers.

THE PUBLIC LIGHTING OF SIDMOUTH.—The *Western Times*, of Tuesday last, says in reference to this subject: "To the inhabitants of other towns the lighting of the street-lamps would appear a small matter and scarcely worthy of remark, but not so here, for when at the commencement of this week they were lit for the first time for nearly two years, the consequence of the darkness of the night was more than compensated by the fact that at the commencement of last winter the Local Board determined to reject the tender of the Gas Manager, and to adopt a system of lighting by means of 'automatic' lamps, which ultimately proved not only a complete failure, but an annoyance to a large portion of our townspersons. Even when the lamps were lit, the light was exceedingly dim, and the consequence was, that the night was exceedingly dark; but that was not all, for generally nearly half the lights were either flickering or completely out before they had been lighted two hours. An increased demand for lanterns was the consequence, and all who did not provide themselves with these—at that time—exceedingly useful articles, were in danger of unpleasantly colliding with any obstruction that might be in the way. This was retrogradation with a vengeance, and the question was often asked, 'Do we live in the nineteenth or the fifteenth century?' and it was really difficult to realize that we were living in such a civilized and enlightened age. After several days of darkness for some time, the inhabitants raised a protest against it, and petitioned the Local Board to remove the automatic lamps, and again light the town with gas. This petition was laughed at, and the ratepayers had to 'bide their time,' but ere long that time arrived. In March three members of the Board retired, two of whom (having voted for the automatic lamps) retired to be re-elected. But the ratepayers had not quite forgotten the winter's darkness, and the certificate of the returning officer showed that these 'economizers' of public funds had not the sympathies of those whose suffrages they sought. Three gentlemen were therefore elected who were resolved to make the convenience and safety of the inhabitants their first object. The result is that a contract has been entered into with the Gas Manager to light the town for three years; the wooden lamp-posts, which by no means were ornaments to our streets, have been removed, and the lights are welcomed as a boon by the inhabitants, experience having taught them that darkness means inconvenience and danger."

THE DISTILLATION OF COAL TAR.

On the 9th of September last year application was made by Mr. G. C. Trevelly, C.E., and Mr. H. W. Fenner, Manufacturing Chemist, both of the Beekton Gas-Works, for a patent for "Improvements in the Distillation of Coal Tar."

In the specification of their patent, which was sealed on the 2nd of March this year, the inventors say: "In the distillation of coal tar, as carried out up to the present time, the heat generally employed for the purpose is that obtained by external fire heat, and it has been found necessary to employ that heat at a much higher temperature for the elimination of the heavier products than their true distilling points, and for two reasons—1. The resistance offered to the escape of the vapours by the large proportion and depth of residual products contained in the still. 2. The bad heat-conducting properties of the said residuals. This excessive temperature so applied has resulted in the decomposition and loss of valuable products, together with an accumulation of coke on the surfaces of the still more immediately exposed to the action of the fire. In consequence it has been found necessary periodically to stop the stills in order to remove the coke so accumulated. When heavy tars have been worked this has necessitated a frequent renewal of still bottoms, and, together with loss of working capacity, has been a serious drawback to tar distillers."

"The object of the present invention is to overcome these difficulties, and the character of the agitation obtained continually renews the contact of the boiling tar or pitch with the surfaces of the still exposed to the fire, thereby preventing caking, and at the same time providing a force for the immediate expulsion of the vapours when they reach their true distilling point."

"It has been found by tar distillers, under the old system, impossible to use coke or other highly heating fuel, on account of the concentration of the heat in the bottom of the still; but in pursuance of these improvements this evil is obviated, and coke or fuel of any kind can be employed."

The annexed engravings are copied from the drawings accompanying the patent. Fig. 1 shows a vertical section, and Fig. 2 a horizontal section of a still, with parts arranged to carry the above-indicated improvements into effect, steam being employed at any convenient pressure.

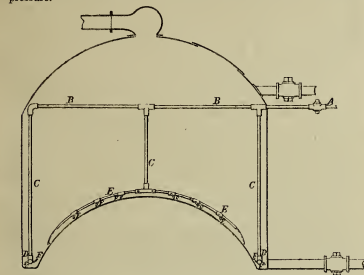


FIG. 1.

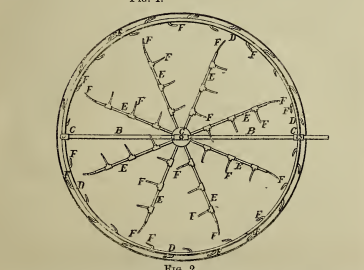


FIG. 2.

The manner of proceeding is as follows:—"The still is worked in the usual way by fire heat until the lighter products have passed over. Steam is then turned in by the cock, A, and is made to traverse the pipe, B, which is connected with the smaller tubes, C, C, C. The two outside lead into the ring, D, the centre into the branches, E, which again lead into numerous smaller outlet-pipes or passages, F. There are as many of these outlet passages employed as may be found desirable. From the pipe, B, the steam is distributed amongst the three columns or tubes, C, C, C, and by the ring, D, and thence by the branches, E, is again subdivided, ultimately striking the gutter and the crown of the still bottom by the outlets, F. The steam entering at A is, in fact, split up and so subdivided that it becomes, by its passage down the tubes through the vapours and body of the boiling tar or pitch, superheated to about the temperature of the tar or pitch, which, of course, renders all risk of boiling over impossible, whilst the increased pressure from the increased heat and expansion of steam causes intense agitation of the tar in the still, and the expulsion of the vapours with greatly increased rapidity. After the admission of the steam through the pipe, B, as stated, it is no longer necessary to increase the fire under the still, but merely desirable to keep it sufficiently alive to maintain the contents of the still at an even temperature, which may be seen by reading a thermometer placed in a tube on top of the still, the end of the tube inside the still being closed."

SANITARY INSTITUTE OF GREAT BRITAIN.

At the Congress of the Sanitary Institute of Great Britain recently held in Exeter, two papers dealing specially with the subject of water supply were read before the Geological and Meteorological Section. Though they refer more directly to the local than the general bearing of the question, they possess sufficient interest to justify their reproduction, with the discussions thereon, in the pages of the JOURNAL.

The first paper was by Mr. T. ANDREW, F.G.S., one of the Vice-Presidents of the Section, and was upon the subject of

THE GEOLOGY OF EXETER IN RELATION TO THE WATER SUPPLY OF THE CITY.

In consequence of an alleged insufficient supply of water from its source in the Exe for the city of Exeter, the Corporation, about 21 years ago, purchased the water-works from the Company in order to make certain alterations and additions should be made as might be from time to time considered necessary. Since then the possibility of a sufficient subterranean supply has been frequently discussed in the local newspapers. It has been argued that inasmuch as Exeter is on the new red sandstone, an undoubted supply of very pure water, enough for drinking purposes, might be obtained; that is to say, enough for the wants of from 40,000 to 50,000 persons. The purpose of this paper is to raise the question among scientific men as to the probability or improbability of so much water being obtained by boring within the city or its environs.

Of course, water must be obtained at some time or other, percolated through the cracks and rends of the surface rocks, and the quantity of water must largely depend upon the surface configuration of the locality. A flat surface is more likely to retain the water than rising ground. Remembering that Exeter is on a tongue of land, and, except towards the east, is surrounded by valleys, it may be said to be surrounded that more than the average quantity of rain water finds its way to the sea. An authority on these matters stated at a recent meeting of the British Association that probably one-third of the rainfall entered the rocks. But I question very much if such a proportion will be found in the rocks of Exeter. Water at a depth of 300 ft., any computation as to the proportion of annual rainfall entering its rocks must be hypothetical. It will also be remembered that the inclination of the beds from or towards the city will be an important factor, as water usually works its way along the plane of the beds. I have known instances of well water being abundant on one side of a valley, and none to be met with at similar depths on the other side.

Reference to a geological map will show that Exeter is in part on carboniferous shales, in part on the trap, and also on the new red sandstone. During the formation of the shales, and most likely towards the close of the carboniferous period, the whole of this neighbourhood, and more or less from Dartmoor to the Land's End, was covered by a series of earthquakes and volcanic eruptions. De la Beche says: "The whole of the shales and sandstones are intermingled with the Trappean in a way to show that there must have been considerable igneous action, during which shales and sandstones have been shoved up, and the surface of the earth has been covered with the deposit of the shales and sandstones. This authority here more particularly refers to the district between Dartmoor and the Land's End; but it appears that a similar volcanic action characterized the termination of the shale period in this locality. Between Exeter and Dartmoor are several volcanic vents, and everywhere in this locality the shale is contorted and torn in almost every conceivable manner. I might also observe that in an important section of the new red sandstone in the Heavitree Quarry the cleavage joints are for the most part so filled with carbonate of lime as to render it impossible for water to find its way through them. Hence the action of springs in that quarry."

Exeter, geologically, may be divided into several areas, as follows:—
1. From the South-Western Railway Station to the bottom of Exe Lane, along what was formerly the Brook; it under the Princess Road to the Hill; and thence by the Street Hill to the west of England Insurance Office, an area will be described which has a stratum of clay from 2 feet to 4 feet thick, of a yellowish colour, and very tough, and beneath the carboniferous shale, commonly called shillet, to a considerable depth. My friend Mr. Parfitt, of the Devon and Exeter Institution, has kindly supplied me with the notes of a boring at St. Anne's Well Brewery, commenced in March of last year. This well will be found situated about midway between Queen Street Station and Exe Lane, and before the filling up of the valley for railway purposes was on the "nap" of the hill descending to the valley. The boring commenced in the shillet, and only reached water at a depth of 305 ft., and then only a quantity not much in excess of the requirements of the Brewery. Mr. Parfitt has kindly furnished me with the notes of a boring of a well for the City Brewery in 1849. At a depth of 15 feet the boring was through water gravel, then for 85 feet through the shillet, for 54 feet more through alternate layers of trap and red shillet, then for 90 feet through blue shale, for 3 feet through water sand, and for 23 feet more through blue shale, making a total of 270 feet. This great depth was necessary in order to obtain water, and, although in a valley, you will perceive is not much less than the number of feet necessary to be bored for the St. Anne's Well Brewery. In digging wells in this rock, the depth of the water is obtained differ very extraordinarily. A well has a fairly good supply at a depth of 9 or 10 feet in one place, while others not 20 yards off had not had water at less than 50 or 60 feet, and in the cases of the St. Anne's and City Brewery wells an approximate depth of 300 feet had to be reached. This will probably result from the presence of numerous faults, or slides of large masses of rock, from various causes, and mainly volcanic. A very good section of this rock may be seen in the Princess Road, close to Head Weir.

2. If another line be drawn from Gandy Street up High Street, along Longbrook Street, and then descend to the bottom of the Street, and follow the line of the ancient brook to the South-Western Railway Station, it will be found to encircle the igneous rock on which the Castle of Exeter stands. The least exposed portion of this rock is very compact and ponderous, and when a portion of the base of the hill was cut away for the South-Western Station, it was thought that the stone was such a hard for the bridge which spans the railway near the prison; but after a few years of exposure the stone softened and gradually crumbled away. It has a granulated, or small grainy and purple ground, sprinkled with minute shining points. It has numerous fissures crossing in all directions, or filled with white hard veins of calcareous spar. After long exposure, this stone degenerates into a red clay, and this clay composes the surface of the Castle Hill, from whence no doubt this eminence derives the name of "Rougemont." This, it must be remembered, was a volcanic rock, and was probably thrust up at the close of the carboniferous period, which may account for the very broken and disturbed condition of the surrounding shillet.

3. From St. Stephen's Bow to St. John's Hospital, including Bedford Circus, the stratum is of sand and gravel; this is followed by clay, mixed with small masses of the disintegrated rock of the Castle, and the sand becomes larger and more compact, and forms a rock of the same kind. The wells in this area are from 20 to 30 feet deep, and give excellent water.

The well water of this locality is far preferable to that of the shale; but immediately beyond the Circus, or Southerhay, we find water certainly unfit for domestic use. In a well behind my own house, in the middle of Southerhay, the water was declared by the City Analyst some twelve months ago to be unfit for domestic use. I have been unable to trace the cause of the presence of so much ammonia in this water.

4. Above St. John's Hospital and Longbrook Street, the second stratum is a fine red sand about 60 feet thick. Under this, in some places, is a bed of soft marl from 4 to 6 feet deep, and then again the red sand. The sand extends all over St. Sidwell's to the old Tiverton Road turnpike-gate. The soil of the adjacent fields has been for a century and upwards used by the brickmakers. But in this area of the new red sandstone there is less water than might be supposed. At Lion's Holt there has been a considerable spring since the time noticed by the City Analyst some twelve months ago. At this place, I have been long in doubt whether it really came from the new red sandstone or from the shale underneath. At Polsoe Road the wells are from 20 to 80 feet deep, and yield an average supply of water, but, so I am told, not much in excess of the wants of the owners thereof. Mr. Hill, great Heavittree, told me a few days ago that there was a well 100 feet deep in the new red sandstone at the corner of the road leading from Magdalen Road to the Barnfield, and, although at so great a depth, there was scarcely any water.

5. But to be more comprehensive it may be briefly stated that a line drawn from Taylor and Bodley's iron foundry, in Commercial Road, to Lion's Holt, thence to the Black Boy turnpike-gate, will describe the boundary line between the shillet and the Trias. In other words, the half of the city on the north and west sides will be altogether on the shillet, and that on the south and eastern portion will be on the new red sandstone. But it has been said that the new red sandstone will be no considerable depth of new red sandstone except at some distance from the city.

My conclusions are—1. That in and around Exeter natural underground basins for the collection of water are not likely to be met with, and that the availability of the Trias for the purpose of supplying the demands of the city of an extinct volcano, which has considerably upheaved the beds, and broken them in almost every conceivable variety of manner. 2. That the depth at which water can be obtained in the shale—indeed, the finding of water at all in any large quantity—is so uncertain as to render judgment upon the matter for an experiment. 3. That the new red sandstone on the south-eastern side of the city, and the surface configuration of this part of the city unfavourable to the collection of a large quantity of water, I am unable to believe that water in anything like a large supply can possibly be obtained at a nearer point than the lower part of Heavittree, about 1½ miles from the centre of the city.

Mr. MARTIN, C.E., said that, as a citizen, he desired to say that they ought to feel greatly obliged to Mr. Andrew for the light he had thrown on the subject. They had been reminded from time to time that there was a report by a distinguished hydraulic engineer which recommended them to search for water immediately under their feet. That report had not been published, he thought, and he would be so glad to see it. People reminded of this without their knowing its tendency. He quite endorsed the remarks as to the supply of water at Lion's Holt. Mr. Andrew did not say in direct terms, but left his hearers to infer that the water issued from the carboniferous mass, and simply oozed out through the new red sandstone in the lower part of the city. He had under consideration the boring of a deep well at Teignmouth, and on making inquiries as to the boring of wells, he was surprised at the result. Two cases were mentioned by Mr. Andrew. At Exminster the boring was made in the new red sandstone, and then they had to go a great deal into the carboniferous shillet. At Exminster, the depth of the wells in several places to show to what extent they had to bore—viz., at Exminster, 473 feet; at Crediton, 246 feet; at Silvertown, 257 feet; at Topsham, 290 feet. If they had to go to such a great depth they would have to pump a considerable cost. They were told from time to time that there was abundance of water at Lion's Holt to supply the city. People imagined that because there was water upon the surface there was an inexhaustible supply underneath. Some time ago he was asked to go to Marypole Head and report as to a supply, a report having been published stating there was an abundance of water on the top. He went, and he found that there was no water there, and he was to report on. There was just enough there to flow through an inch pipe.

Mr. PARFITT said they must bear in mind that from the River Exe, extending about 1½ miles in an easterly direction, was the collecting-ground of the water, broken up by geological faults, and he was certain that a large part of the water collected from the hills would be supplied Exeter. Just below Polsoe Farm there was a very thin layer of the new red sandstone, over the carboniferous; it lay along the whole of the valley out by the South-Western Railway. Two gunshots beyond that there was a cutting, where the brook had cut its way down to 30 or 40 feet, and this showed that it was "faulted" against the carboniferous. It held the water in this particular place for what was called St. Anne's Well. There was no other place where there was anything like a supply for a large city. At Heavittree Brewery the well was 375 feet deep, and as it did not yield a sufficient supply it was intended to sink it to a depth of 400 feet, but it was found that it was not worth the trouble, and the opinion, the ground was round about Exeter, within the collecting area, was that there was about two miles, was so "faulted" that it was not likely that water would be obtained from it in sufficient quantity for the city of Exeter.

Mr. BOOLEY had been told that in Exeter they had an imaginary supply of water immediately beneath their feet, but, having been engaged in connection with the large pumping-wells in the neighbourhood, he could refute that piece of imagination. The local paper makers, in an endeavour to compete with the Kent makers, tried three wells at Exeter, but the water was unsuitable for paper-making. At Huxham and Heavittree wells were bored with the intention of supplying the city. At Huxham there were wells 114 feet and 120 feet deep. In this neighbourhood the wells did not supply anything like the quantity of water they were supposed to do. As to the St. Thomas's water supply, the well there first went through the top soil, then through 9 or 10 feet of gravel to the shillet, and then the water was obtained from the shillet. The water from the gravel—a quantity so small as to be inappreciable. It was foolish of the citizens to attempt to sink a well—indeed, they went to an enormous depth. There was no percolation through the shale from which they could get the water. At the brickyards a sufficient supply of water could not be obtained from the wells to saturate the clay for making into bricks.

Dr. CARPENTER said that the water he had had since he came to Exeter had been very good, so far as its appearance went, and he should be satisfied with it; and he understood that this was obtained from that natural source, the collecting-ground which was the Trias, and that was the water of Exeter. The citizens of Exeter would not have far to go for a water supply, for Nature had provided them with a collecting-ground in their neighbourhood, the overflow of which went into the river. It was very wrong of the Authorities to allow such rivers to be defiled, as they ran from their pure source. It was morally and criminally wrong on the

part of any Local Authority to pour into those rivers the sewage of their towns in the unpurified state in which it was poured into their rivers, and as he knew that it was poured into the river at Exeter. They could not allow the Authorities in the higher part of the district, at well as those nearer Exeter, to refrain from polluting the river, and then there would be an abundant supply of good water. Providence had some other object in providing rivers than, as a gentleman once said he regarded them, for the supply of canals, or to build towns upon. The rivers never failed, and were provided for our supply of water, and the lake districts were intended to provide for the great centres of population that which they want—pure water. If the law were carried out properly, there would be no deficiency in the water supply for the city of Exeter.

Mr. R. RAWLINSON, C.B., said this was essentially a local question. Whether water could be obtained in sufficient quantity from the wells could only be tested by the fact of its being obtained. It was no use to speculate, geologically or meteorologically; and after the evidence they had heard it was not very encouraging for them at Exeter to go into a large expenditure in the endeavour to get a water supply from wells. Liverpool and Manchester, supplied from this source, had had to give it up and go beyond. Wolverhampton had had to go outside and get water plus the wells. Birmingham had also had to supplement its wells. New York had had to do the same. Many persons were so stubborn that no one on earth would be able to convince them to the contrary if they had once got it into their heads that they had only to sink a well and get water—leading Town Councils into expenditure because they would listen to neither rhyme nor reason. They declared that water could be had, and they induced Town Councils to expend money because they thought that the water could be obtained. It was important that Exeter should not be led into error. Some gentlemen said that the new red sandstone was not a water-bearing stratum. Those gentlemen showed that they knew nothing of the trust of the earth. In Yorkshire there were mines of from 1000 to 2000 feet in depth, and he did not know any mine exceeding 1000 feet which did not go below the water-bearing strata, so that they had to send down water to water the mines. At Buxton and Matlock, the water was obtained from their stratification. Buxton and Matlock stood upon the limestone. All limestones were fissured. Rain was the purest water, and it filtered into the cracks or fissures, combined with the lime, and took away the bicarbonate, until ultimately they had the surface water, after ascending a syphon, perhaps 1000 feet, coming to the surface. There was nothing magical about it. Those gentlemen attempted at Exeter to get water from the new red sandstone, they would fail; as, judging from the geological "dip," it all went away, although he could not say where it went. But there must be places, not very far distant, where they could get a good supply, if the rivers could be satisfactory. He would recommend the Town Council to expend any money on well-sinking, to obtain the Sixth Report of the Rivers Pollution Commission, which contained more information on wells, well-boring, and analyses, than any he knew, and they might study it with great advantage.

Mr. SYMONS said Mr. Rawlinson had epitomized for him the experience of other places. Some people liked to try their experience, but he advised Exeter not to do so. No matter how much sewage might be purified, he did not like the idea of drinking the water after it came from a sewage farm. He should infinitely prefer going to those glorious moors, and taking the water, which was perfectly pure, only tinged with a little peat, which was absolutely harmless. He would not like to go to Dartmoor, but he would be to a great extent blindfold if he went to Dartmoor without ascertaining the rainfall, while the expenditure of a small sum, perhaps £20, would supply the requisite meteorological data, and might save the expenditure of thousands of pounds.

Mr. ANDREW said he had just completed some well-borings in the tertiary, in the endeavour to get down to the greensand, under the supposition that he would get a larger and better quantity of water than from the chalk. In boring it was found that the sinkers completely tubbed out the vein which contained the water in the chalk. In Devonshire it would be found that the tertiary was not a water-bearing stratum, but that the subterranean wells; and to find such a geological formation to be supplied with subterranean wells was not to be expected. The Dartmoor supply, if it could be had, would be a very simple thing.

Mr. C. FOX suggested that if Dartmoor could supply Plymouth, certainly it should supply Exeter. He also recommended the perforation of Haldon.

THE PRESIDENT, as a geologist, had no hesitation in saying that the author of the paper was abundantly justified in the advice which he had given. Strata like those at Exeter could not have a water-bearing power. If the Exeter water was Nature made it, there would be no difficulty in the supply of water to the city.

The Mayor of EXETER, in moving a vote of thanks to Mr. Andrew, said that it was fortunate for the citizens that the discussion had been raised. After the opinions expressed by Mr. Rawlinson and Mr. Symons, instead of wasting time on impracticable schemes, Exonians should now set to work and call upon the towns on the banks of the Exe to stop the flow of sewage into the river.

Mr. ANDREW, in acknowledging the vote, remarked, as to the suggestion that Haldon should be perforated, that he did not believe it would be advantageous, judging from the surface configuration of the country. It was not likely that there would be a supply of water on the west side of Dartmoor, and he had very little doubt that there was a similar supply on the east side, which he should recommend to be tried.

The other paper was on the subject of

ORGANIC IMPURITY IN THE WATER OF THE EXE.

the author being Mr. F. P. PERKINS, the Public Analyst for Exeter. In the course of his paper, the writer dealt with the amount of organic impurity contained in various samples of the water of the Exe taken at certain points in its course from Tiverton to Exeter, commencing with a few remarks thanking the City Surveyor (Mr. H. P. Bullock) for his kind co-operation in furnishing samples of the water for analysis. Mr. Perkins continued as follows:—

Starting a mile above Tiverton, to find the water of medium purity, was the first part of the investigation, and the organic matter, about 100 parts below Tiverton, after the water has been collected by the sewage of the town, and has passed through the mills, the amount of oxygen absorbed is—as might be expected—larger, being 0.0873 parts. At two miles below the town it is still more polluted, and the amount of oxygen is 0.0920 parts. After flowing over a stony bottom, and just above Bickleigh Bridge, in still water, with water which has been the organic matter considerably reduced; the proportion of oxygen consumed being 0.0738 parts. Passing on to that taken below Bickleigh millstream, the amount of impurity again increases; for the quantity of oxygen required is 0.0920 parts. But the quantity of this is at once apparent. The water in the Dart, which flows into the Exe, is about one mile above the place from which the previous specimen was taken, is very foul, requiring not less than 0.207 parts of oxygen for the oxidation of its organic matter. The water now passes over a gravelly bottom, and ripples over natural veins, and at Bourne Mills, just below the junction of the Bourne, the

water becomes much improved in quality. At Thorton it appears to be again slightly fouled, but recovers itself by the time it reaches Netherex, after flowing over a weir. At Stoke railway bridge the river is much deeper, and is not quite so pure.

There are two points gained in this examination—1. That were it not for the dirty River Dart, the water supply of Exeter would be much better than it is. 2. That Nature's process of oxidation, as carried on in rivers, is, under favourable circumstances, anything but slow. Let but the water tumble over a weir or ripple along a stony bed, or let there be an abundant growth of plants, and we find even in a short course a great change for the better. This is well illustrated in the flow of the river from the Dart to above Thorton, where the bed is rocky. Even at Tiverton, after the water is churned up by passing through the mills, it must come out purer than it went in; for water taken at the point where the sewage is delivered into the river would be much more contaminated. In the deeper parts of the stream, oxidation seems not to be so rapid. To laboratory experiment, however, I willfully devoted the water of Nature's process. Here is a river, open to the air, and subject to the variable yet constant action of heat and light. The supply of air is unlimited, and changing momentarily; every breeze that is wafted over the surface of the river bringing the purifying agency in contact with the water, and every ripple showing its own condition. The constant evaporation from the surface, and the continual molecular change that thereby ensues, must be the means of breaking up organic compounds, and also aid materially in purification. The old saying, then, that "running water purifies itself," is well illustrated in the flow of the river; but to bring into direct contact with the air or with oxygen, and to make it perfect, it is not the sewer that some imagine it. As it is, it bears favourable comparison with any of the rivers of the kingdom; and when its water is carefully filtered it reaches a high standard of purity.

Mr. H. P. BULNOIS said he desired to add a few remarks to Mr. Perkins's paper. He had samples of water taken from the River Dart referred to him by him (Mr. Bulnois) on the 16th of August of this year, the water in the Exe being abnormally low. In taking the samples, he noted the velocity of the flow of the water, the character of the bed of the river, the appearance of the water, its depth, and other particulars, which he described. The samples were all taken from as near the centre of the river as possible, but, unfortunately, he had no appliance with him for registering the temperature of the water. The fifth sample referred to was taken from a stream called the Dart, near its junction with the Exe at Bickleigh Bridge, its velocity at this point being at the rate of 12 miles per hour. Its depth was 12 feet, and the bed was a gravelly, stony nature, being covered with a slimy dark deposit or vegetation, giving to the water a grey, dark hue. This description gave an idea of the appearance of the stream and of the small rivulets joining it for about three miles above the confluence of the Exe. This stream rose on Glastonbury, on the outskirts of Exeter, and it was not far from the Dart, which flowed westward; but both the streams were quite distinct from the well-known River Dart, and not to be confounded with it. The stream from which the sample in question was taken flowed S. and S. by E. till it joined the Exe. It passed exclusively through a pasture, apparently, on referring to the Ordnance map, and could not receive any amount of contamination from dwellings existing to give it the bad character Mr. Perkins had assigned to it, no populous place being in its vicinity. The presence of such an excessive amount of organic carbon must, therefore, be due to pest. He had not yet had an opportunity of inspecting the stream through its entire length, but he should now be tempted to do so, after hearing Mr. Perkins's paper. With reference to an attack that had been made on the water supply of Exeter by Dr. Bankart, who complained of the source from whence the water came, and that Tiverton drained into the Exe, the paper just read, he thought, had improved the material fact of the source of the Exe, as applied to the inhabitants, was as pure as it could possibly be expected to be. There was no doubt that a large comprehensive gravitation scheme for bringing water from either Exe or Dartmoor would be a great thing for the city, but it would probably cost over £100,000. With reference to the question of a constant supply, he, and his colleagues, the whole of the Town Council, were anxious to see that the water supply was secured. He stated that certain extent rested with the citizens. In some districts he had discovered water to the extent of 75 gallons per head, and it was impossible to give a constant supply of water while this waste continued. By-laws, however, had been proposed to meet the case, and only needed confirmation; but he was afraid this would be a long time before the Council would be ready to give a constant supply, which they could not do until the waste was stopped.

A NOVEL OBJECT OF A FLOWER SHOW.—On the evenings of the 24th and 25th ult., a flower show was held in the Low School Room, Galgate Lane (Lancs.), with the object of obtaining funds to assist the Galgate Gas Lighting Association, which has for its object the erection of lamps for the better lighting of the village in the winter months, in prosecuting its labours. Already 13 lamps have been supplied through its instrumentality.

THE SALFORD NEW SEWAGE WORKS.—On Thursday last a party of visitors from the Manchester Sanitary and Mechanical Society paid a visit to the new sewage works which are being erected at Mossley, near Weaste, by the Salford Corporation. The works, which will ultimately cost about £50,000, are being constructed for dealing with the sewage of the borough, which is at present emptied direct into the River Irwell, and are being constructed by the Borough Engineer, Mr. Jacob. The process adopted is precipitation through a series of large tanks, by means of which one ton of which is used to every million gallons of sewage. The visitors were able to inspect the arrangement of the precipitating-tanks which are now nearly completed. These tanks are constructed of concrete, of which there are about 100 cubic yards, and are capable of holding 5 million gallons of sewage. The works are being constructed on a level of 10 feet above sea level, and are situated on an area of about 14,000 acres, and the minimum quantity to be dealt with during dry weather will, it is estimated, be about 7500 gallons per minute, whilst the maximum may reach to about 16,000 gallons. The sewage is first strained, and will be received in pump wells, from whence it will be passed to the mixing-house, where it will be mixed with lime, for which purpose a couple of engines of 320-horse power minimum will be employed. The sewage is then conveyed by 13-inch pipes to the tank farthest from the engine-house, where the impure matters are separated, and the clear water is allowed to flow into the next. The solid matter after settlement goes down into pits to dry, and will be afterwards supplied to farmers for agricultural purposes. The pure water is received into a channel, along which it passes to a chamber where it develops sufficient power for working a screw-driven precipitator, and the clear water is allowed to flow into the machinery, which will be employed to load barges with the sewage. After this it is allowed to pass into the river. The visitors were conducted over the works by Mr. Mestayer, the Deputy Borough Engineer, and Mr. Pilling, jun. (Messrs. Pilling and Son, of Bolton), one of the contractors.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The leading event of the past week in connection with gas affairs in Scotland was the opening of the Exhibition of Lighting and Heating Apparatus, &c., under the auspices of the Philosophical Society of Glasgow, the collection of exhibits being the work of the late Mr. James Watt, of Forth Colliers, in the presence of a very large and influential gathering of citizens. As descriptive notices of the exhibition will appear in other columns of the JOURNAL, it is not necessary that I should enlarge upon the subject in these brief "Notes." It will suffice if I simply say that the collection of exhibits is one of a most extensive, varied, and interesting character, and that it is scarcely probable that even the most sanguine promoters of the undertaking had any expectation of its turning out to be such a magnificent success as it has already proved to be.

Another event of importance was the half-yearly meeting of the West of Scotland Association of Gas Managers, held at Forth Colliers on Friday, under the presidency of Mr. Carlow, the Manager of the Corporation Gas Works of that town.

There are already indications of the return of the annual elections to the Town Councils in Scotland by the appearance of the present members of the Councils before their constituents to give an account of their stewardship. In such cases gas affairs are not unfrequently made the subject of remark by the municipal representatives and by the electors. At a meeting of the ratepayers of one of the Glasgow municipal wards with their representatives on the evening of Friday last ex-Ballie Walls, the Convener of the Corporation Gas Committee, presided, and his office is about to expire, was the leading speaker, and in the course of his remarks he made gas matters the first subject to dilate upon. He said that he had recently in the Town Council gone into minute detail as to the working of the town's gas affairs since 1870, when the Corporation took over the gas works. It is difficult to remember the figures, and that which is remembered in May last was very marked. He repeated the figures which he gave at the Town Council meeting, and said that the highest price which the gas had reached since it came under the control of the Corporation was 5s. 5d. per 1000 cubic feet, whereas the price was now reduced to 3s. 10d. The total saving to the company for the past year was £42,400 per annum. It was important to keep in mind that every penny that was taken off the thousand feet of gas reduced the rates 1d., that was to say, if 2d. per 1000 cubic feet was taken off the price, it was equal to a reduction in the rates of 1d. per 1000 cubic feet.

A meeting of the Gas and Water Committee of the Inverness Burgh Commissioners was held last Thursday. Provost Mackintosh presiding—when a statement in reference to the gas accounts was submitted by Mr. Hay, the Treasurer. Having enlarged upon the ways and means for the ensuing year, he suggested that the price of gas should be reduced from 7s. 6d. to 6s. 8d. per 1000 feet, a reduction of 10s. 1d., and on the motion of Mr. Ross, seconded by Mr. Macdonald, it was resolved that such a reduction should be made, which it was considered could be safely afforded, as it left a good margin for any contingency.

The annual general meeting of the Whitburn Gas Company was held last Tuesday—Mr. R. Gardner, Chairman of the Company, presiding. A statement of the income and expenditure of the Company for the past year having been submitted and considered satisfactory, it was resolved that a dividend at the rate of 5 per cent. per annum should be declared.

The supply of gas and water to the town of Ardrossan is in the hands of a private Company, known as the Ardrossan Gas and Water Company, and a number of people the town think that both should pass into the hands of the Police Commissioners, a public meeting was held last week to consider the propriety of asking the Burgh Commissioners to open negotiations for the purchase of both undertakings. After a good deal of discussion an amendment was carried, asking that the Commissioners be empowered only to take action in respect of the water supply, the question of the gas-works being held over in the meantime.

On Monday last week business was done in the stock of the Edinburgh and Leith Gas Company at £35 per share, and on the following day at an advance of 10s. per share.

For some time past the water-main from the Dobburn, for the town of Hawick, has begun operations, and work will be vigorously prosecuted with. Meantime, Mr. Gale, C.E., of Glasgow, has been employed by the Committee of the ratepayers, who, in public meeting, urged inquiry on the Town Council to desist from carrying out the Dobburn scheme. The latter expected the course of the Dobburn, as the water from the Allan, which the Committee consider preferable and more economical, he has reported that he considers a sufficient supply, at the required elevation, could be had cheaper from the Allan than from the Dobburn.

An enormous business was done in the Glasgow pig iron market last week, and a rapid advance in prices took place. As high as 50s. per cash was paid on Wednesday, and at the close on Friday the price was down to 50s. cash.

The coal market is still slow as regards business. House orders are scarce and small, but for shipping there are a few more inquiries. Prices remain low.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The only change which has taken place in the coal trade of this district during the past week has been a slight upward movement in certain classes of coal. The principal colliery firms in the Manchester district have, following their usual practice, this month advanced their delivery rates to consumers 10d. per ton, and the prices at the local wharves and retail depots have correspondingly been advanced. It is not unusual for ruling prior to the reduction in July, which represents an advance of about 6d. per ton on some classes of round coal. Outside of Manchester, however, there is no material alteration. The demand for the better classes of round coal, although certainly improving, has not yet increased sufficiently for coal to warrant any advance in the ruling prices, but there is a tendency to harden where sellers have been taking exceptionally low prices to secure orders. Indeed, the available supplies in all the principal colliery districts are so large that there is no probability of any materially higher prices being obtained, at least for the present. Certain coals for domestic and steam purposes, such as the "best" in the pit, with little variation either as regards prices or demand. Engine classes of fuel are held firmly as a rule for late rates, and the continued small supply of slack is a proof of the comparatively limited quantity of round coal at present being screened. Best Wigan Arley is in some cases quoted at 6s. 6d. per ton at the pit; but good qualities are not obtainable at 7s. 6d. to 8s., and common sorts and Pemberton four-foot average about 6s. to 6s. 6d. per ton; common Wigan mines for steam and forgo purposes range from 4s. 9d. to 5s. 3d., burgy from 3s. 9d. to 4s. 8d., and good slack about 3s. to 3s. 6d. per ton.

A fair quantity of coal is now being shipped to Liverpool, but shipping orders are taken at very low figures, steam coal delivered at the high level being obtainable at from 6s. to 6s. 6d., and other sorts from 7s. to 8s. per ton according to quality.

In a few cases the pits are now working rather better time, but in

most of the large districts the average is not more than about four days a week.

In the iron trade business has been extremely dull during the past week, no orders of any importance being reported in the market. So far as Lancashire pig iron is concerned, prices are only nominal, makers being open to offers, and in the finished iron trade there is an easier tone, as many of the local forgers are now getting short of work. For delivery into the Manchester district bars can be bought readily at £6 per ton, and some sellers would take less.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The local coal trade, although somewhat slightly improving, is still comparatively dull, and the winter contracts are not of extensive character. The past week's markets were well attended, and a more cheerful aspect prevailed. A few of the pits were well employed in drawing fuel for iron-making purposes, otherwise the majority are only partly employed. At the pits of the Earl of Dudley an increase of 10 per cent. is reported for the past month. Prices are, on the whole, far from being satisfactory. Forge coal is being sold as low as 7s. 6d., and slack at 2s. 6d. per ton. Gas coal is in better request, and coke is also more inquired after. The drainage difficulty is still a matter of anxiety, and in some cases the heavy rates are a drawback to successful mining operations.

The iron trade in most respects remains unchanged. Prices are firm, and for a few qualities slight advances are asked. The new sliding scale has proved that makers have been trading on worse grounds than was believed. This much has been demonstrated by the results of the first examination of the books of the twelve selected firms. The average price obtained for the month of June was £19. 10s. 6d., and that for July only £19. 8s. Therefore, in accordance with the sliding scale, the wages of puddlers will be reduced by 1s. per ton, and mill-men 10 per cent. for the next three months. Masters must consequently have been selling at about £2 per ton below list prices. With a view of bringing about a greater degree of uniformity in prices, meeting of sheet-iron makers was held at Birmingham on Thursday last. Representatives from most of the largest rolling-mills in the district were present, and a resolution was passed by which the makers of the South Staffordshire and adjoining districts form themselves into an association for the purpose of fixing a more even rate of wages, and to maintain the relative prices between the different gauges. It is now pretty generally understood that little or no alteration will be made in the present rate for the incoming quarter; nevertheless, buyers will in most cases withhold the placing of orders until the arrival of the quarter-day meetings. Last week's markets were regarded as very quiet, and the prices of the various qualities of iron were, however, are very confident as to the future, and preparations are being made for further development in the number of furnaces. Common cinder pig iron is still as low as £2, whilst part-mine averages £3, and hot-air all-mine about £3 5s.; sheets, singles, and fine, at £9; and marked bars, 47 lbs., to 55 lbs., of the same brands, £4 10s. and £5. The market for mill-iron kinds, such as hoop and strip, there is a fair market, and prices are firm. The girder and bridge iron trade is tolerably good, and at several of the foundries there are sufficient contract orders in hand to last the hands well into the winter. The export trade in this department is considered to be improving.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Advices received from London and other markets go to show that a better tone pervades the coal trade in many parts of the South Yorkshire district. This is believed to be a great measure from the fact that some of the pits are likely to issue advanced price lists, as they usually do at this season of the year, so that any permanent improvement is doubtful. Some of the leading merchants in the Eastern Counties have during the past week or ten days been forwarding a liberal supply of waggons; a thing they have not done for some time. The Metropolitan trade has also increased, but it is doubtful whether any material increase can be sustained in prices, the output of the district being so large. The pits in the Wombwell Wath and Mexborough districts are working very fairly, and those at Dodworth belonging to the Silkstone and Dodworth Coal and Iron Company, and the Stridley Colliery, are also working well.

The steam coal trade is rather on the wane, owing to the export season becoming advanced. Many of the largest pits where the coal is of good

quality are doing a heavy trade with Hull by both rail and water; but the tonnage forwarded to Grimsby has not been so large during the past fortnight, and hence the exports are showing a marked decline. A fair tonnage of the same class of fuel is being sent to Goole and Hull from the West Yorkshire collieries, the former port being very accessible to the collieries in the Normanton and Leeds districts.

About an average quantity of both gas and locomotive coal is being supplied from the pits in both parts of the coal-field, chiefly on account of contracts entered into early in the year, and in some instances prior to that. Several of the Railway Companies are drawing large supplies from various collieries; but the prices at which the contracts were placed were so moderate that the owners have to depend on other sales for a profit.

The coke trade is undoubtedly the most profitable adjunct just now pursued in connection with mining operations, and it is satisfactory to have to state that notwithstanding the vast and increasing output which daily takes place in various parts of the district, business remains pretty active. Perhaps in no branch of the trade has there been a larger outlay than in the coke trade. With a view of competing with North of England manufacturers, large sums of money have been, and are still being, expended in washing and crushing machinery, so that some splendid coke is made. The demand for North Lincolnshire continues large, and as two or three new furnaces are likely to be blown in shortly, business is likely to increase.

The labour market throughout South Yorkshire is still greatly disturbed by disputes of various kinds. Coalowners are compelled to demand reductions of wages, as the pits are not paying, so that to work them at a loss is almost out of the question. At the North Gawber Hall Colliery the Directors propose to pay, as far as possible, solely on the tonnage. The price in connection with mining operations, and it is satisfactory to have to state that notwithstanding the vast and increasing output which daily takes place in various parts of the district, business remains pretty active. Perhaps in no branch of the trade has there been a larger outlay than in the coke trade. With a view of competing with North of England manufacturers, large sums of money have been, and are still being, expended in washing and crushing machinery, so that some splendid coke is made. The demand for North Lincolnshire continues large, and as two or three new furnaces are likely to be blown in shortly, business is likely to increase.

SALE OF SHARES IN THE READING GAS COMPANY.—On Monday, last week, Messrs. Cooper and Son offered for sale, by public auction, in Reading, 700 new 7 per cent. shares in the above Company. The whole of the shares were disposed of at a good premium, the highest price realized being £14 12s. 6d. per £10 share, the majority of the lots being sold at 10s. 6d. per £10 share.

BURSTING OF A WATER-TANK AT THE CRYSTAL PALACE.—Last Thursday afternoon one of the large water-tanks standing in the north-west portion of the grounds of the Crystal Palace, and used for supplying the fountains, suddenly burst with a loud report, leaving an aperture fully 16 feet square, through which the water rushed with great force. The tank being seven hundredweight were carried to a distance of 250 ft. The tank was 4 ft. by 48 ft. by 20 ft. deep, and was connected by a large pipe to a similar tank close by. Both are composed of cast-iron plates, each 8 ft. by 4 ft., and 1 in. thick, riveted together by strong bolts, and further strengthened by diagonal bars in order to resist the great strain put upon them. The tanks were supplied with water by a pump, and the water was being forced through a large pipe into the tanks. The water rushing across the road and into the grounds of the residents adjoining did serious damage. An examination of the portions of the tank which it was possible to get at disclosed that the cause was probably the case of the diagonal bars, from which it was evident that three or four bolts had been missing for some time, causing the bar to give way under pressure until it had gradually broken through, and afterwards slipped from its position, leaving the plates of cast-iron unsupported, and consequently not able to resist the pressure put upon them. The damage, of course, is very considerable, but it is a matter of congratulation that no lives were lost, nor any serious personal injury sustained.

Share List of Gas and Water Companies.

Number of Shares issued.	NAME.	Amount paid up per Share.	Last Divd. p. Cent.	Latest Quotations.	Number of Shares issued.	NAME.	Amount paid up per Share.	Last Divd. p. Cent.	Latest Quotations.
589944	Gas Companies.	£ s. d.	£ s. d.	£ s. d.	6200	Gas Companies.	£ s. d.	£ s. d.	£ s. d.
10000	10 Alliance and District	10 0 0	10 0 0	17-14	30000	10 Glasgow Corporation	10 0 0	10 0 0	41-41
5000	20 Anglo-Romano	20 0 0	20 0 0	21-23	115000	100 Grimsby Gas	100 0 0	100 0 0	186-190
1000	20 Bahia (Limited)	20 0 0	20 0 0	15-16	100	100 Hampton Court	100 0 0	100 0 0	15-16
1000	20 Do, 1st pref.	20 0 0	20 0 0	15-16	100	100 Hong Kong (Lim.)	100 0 0	100 0 0	15-16
1000	20 Do, 2nd pref.	20 0 0	20 0 0	10-10	5000	100 Imper. Continental	100 0 0	100 0 0	10p. 2s. 1p.
40000	5 Bombay (Limited)	5 0 0	5 0 0	6-6	200000	100 Kingstons	100 0 0	100 0 0	18-19
10000	5 Do, 4th issue	5 0 0	5 0 0	6-6	100	100 Liverpool	100 0 0	100 0 0	185-190
10000	10 Bourne	10 0 0	10 0 0	13-14	100	100 London	100 0 0	100 0 0	185-190
229700	10 Brentford	100 0 0	100 0 0	15-16	100	100 London	100 0 0	100 0 0	185-190
1000	Do, 5 per cent. pref.	100 0 0	100 0 0	15-16	100	100 London	100 0 0	100 0 0	185-190
1000	Do, 6 per cent. pref.	100 0 0	100 0 0	15-16	100	100 London	100 0 0	100 0 0	185-190
5400	20 Brighton	20 0 0	20 0 0	36-38	100	100 London	100 0 0	100 0 0	185-190
5000	20 Brighton and Hove	20 0 0	20 0 0	35-37	100	100 London	100 0 0	100 0 0	185-190
12000	20 Bristol	20 0 0	20 0 0	35-37	100	100 London	100 0 0	100 0 0	185-190
7382	20 Cagliari (Limited)	20 0 0	20 0 0	17-18	100	100 London	100 0 0	100 0 0	185-190
1500	10 Colney Hatch	10 0 0	10 0 0	9-11	100	100 London	100 0 0	100 0 0	185-190
55000	5 Commercial	5 0 0	5 0 0	13-14	100	100 London	100 0 0	100 0 0	185-190
70000	Do, 7 per cent.	100 0 0	100 0 0	13-14	100	100 London	100 0 0	100 0 0	185-190
20000	20 Continental Union	20 0 0	20 0 0	20-21	100	100 London	100 0 0	100 0 0	185-190
27000	Do, new	100 0 0	100 0 0	13-14	100	100 London	100 0 0	100 0 0	185-190
70000	Do, preference	100 0 0	100 0 0	24-25	100	100 London	100 0 0	100 0 0	185-190
75000	20 Crystal Palace District	100 0 0	100 0 0	17-18	100	100 London	100 0 0	100 0 0	185-190
125000	Do, 7 per cent.	100 0 0	100 0 0	17-18	100	100 London	100 0 0	100 0 0	185-190
50000	Do, preference	100 0 0	100 0 0	18-19	100	100 London	100 0 0	100 0 0	185-190
25000	Do, 6 per cent. 7 p. c.	100 0 0	100 0 0	17-18	100	100 London	100 0 0	100 0 0	185-190
7100	25 Edinburgh	25 0 0	25 0 0	40-48	100	100 London	100 0 0	100 0 0	185-190
25400	10 European (Limited)	10 0 0	10 0 0	19-20	100	100 London	100 0 0	100 0 0	185-190
12000	10 Do, new shares	10 0 0	10 0 0	6-7	100	100 London	100 0 0	100 0 0	185-190
1000	10 Do, 1st pref.	10 0 0	10 0 0	17-18	100	100 London	100 0 0	100 0 0	185-190
409500	30 Gaslight & Coke A	100 0 0	100 0 0	17-18	100	100 London	100 0 0	100 0 0	185-190
100000	Do, B	100 0 0	100 0 0	75-78	100	100 London	100 0 0	100 0 0	185-190
10000	Do, C	100 0 0	100 0 0	75-78	100	100 London	100 0 0	100 0 0	185-190
20000	Do, C 10 p. c. pref.	100 0 0	100 0 0	20-22	100	100 London	100 0 0	100 0 0	185-190
30000	Do, D	100 0 0	100 0 0	21-22	100	100 London	100 0 0	100 0 0	185-190
165000	Do, E	100 0 0	100 0 0	21-22	100	100 London	100 0 0	100 0 0	185-190
30000	Do, F	100 0 0	100 0 0	21-22	100	100 London	100 0 0	100 0 0	185-190
60000	Do, G	100 0 0	100 0 0	21-22	100	100 London	100 0 0	100 0 0	185-190
180000	Do, H	100 0 0	100 0 0	21-22	100	100 London	100 0 0	100 0 0	185-190

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TO CORRESPONDENTS.

J. O. N. R.—Have not been able to do anything this week with the "Note" you have kindly sent. Shall probably refer to it next issue.

G. D. M.—Too late for use this week.

Notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 12, 1880.

Circular to Gas Companies.

THE ordinary half-yearly meeting of the London Gaslight Company was held on Wednesday last, when the Directors report and the statement of accounts, which will be found in another column, were adopted, and the full statutory dividends declared. Considerable curiosity prevailed, up to the time of the meeting, as to the announcement, if any, which the Governor might have to make concerning the attitude of the Board with reference to amalgamation with either The Gaslight and Coke Company or the South Metropolitan Company, or perhaps both. As it happened, Mr. Major Rohde Hawkins did not mention this burning question at all until it had been brought forward by one or two other speakers, and then his utterances were much of the same character as the remarks made by him on the subject at more than one previous meeting. Mr. Hawkins has done us the honour to adopt a phrase used in these columns, when commenting on the report in a recent number. We then said that it had a

fine old flavour, not tinged with mustiness; and now, while adhering to that description of the report, we cannot conscientiously say that all the Governor's arguments and remarks were, although old, entirely free from the latter taint. We have no fault to find with the subject matter of the greater portion of the Governor's introductory speech. His references to the Company's business were marked with well-founded feelings of contentment; the announcement of a reduction in price was satisfactory; and his warning to timid Shareholders to preserve their confidence in the stability of gas property, in view of a possible revival of electric "scares," one of which is perhaps about due, was clear and well timed. If any panic should set in among the proprietors of London gas stock during the dark days of the coming winter, it will not be the fault of the Governor of the London Gaslight Company, and any Shareholders who may be foolish enough to disregard his counsel will richly deserve the loss which they will in that case suffer. But when Mr. Hawkins complacently bids his friends and constituents to believe in the impenetrable safeguards of high prices and low quality, by the aid of which the Shareholders of the London Company are to revel in maximum dividends when the miserable Proprietors of the other Metropolitan Companies, now rejoicing in bloated dividends, are reduced to pauperism by the action of the sliding scale, he is making too great demands upon our credulity. We cannot think that the Governor has ever contemplated, as a serious possibility, the spectacle of one among the Metropolitan Gas Companies attempting to exist by charging 4s. 6d. per thousand feet for twelve-candle gas. As Mr. Hobson put it in his broad and politic speech, the days when this sort of thing would have been endured are gone for ever; and to invite confidence in a strength depending on powers which it would be suicidal to employ, is indeed an invitation to dwell in a fool's paradise. The strength of the London Company does not depend on any such battery of rusty weapons as the Governor would apparently have us believe in, but rather in the ability to make handsome profits by selling gas as good and as cheap as any of their neighbours, and to carry on a sound and elastic trade within the district which belongs to them.

It is impossible to maintain that the London Company, dividing ten per cent. only, are one whit stronger in consequence than either of the other Companies who now divide nearly two per cent. more. But there is, at least, one contingency in regard to which the value of the Companies would be held to depend directly on the amount of their dividends. We allude to the possibility of purchase by a Central Authority. The President of the Board of Trade has had a great deal of experience in the transfer of gas undertakings to municipal authorities, and if, in any scheme of a united Municipality for the Metropolis which he may have in contemplation, the transfer of the gas and water undertakings should be included, the magnitude of the interests involved would not have any terrors for him, for he knows very well that these transactions, great or small, when properly conducted, can be made to pay. In such an eventuality as this (and none would deem it chimerical), can it be doubted which class of Shareholders—those receiving ten, or those obtaining twelve per cent.—would fare the better?

If the system of maximum dividends cannot be shown to be advantageous to the London Company in the event of a general extinction of all the Metropolitan Gas Companies, it is no less difficult to see in what way the Company's peculiar legal powers will serve them in any possible scheme of amalgamation to which the other parties would consent. And if, as the Governor believes, the two adjacent Companies, north and south of the Thames respectively, are consumed with the desire of dividing the London Company between them, it is not at all likely that they will be influenced in the slightest degree by the phantom parliamentary immunities of the Company which, insubstantial as they are at present, would at once disappear upon amalgamation. The value of the property to the purchasers would be just what it could be made to yield under the regulations which would be brought to bear upon it directly it changed hands. But is the Governor right in assuming that the neighbouring Companies are so eager for what the Yankees call a "deal"? and, moreover, which of the two sides, vendor or purchaser, can best afford to play a waiting game? Whether the Directors of the London Company like it or not, the question is already settled by the stern logic of facts; the event is but a matter of time. Every year brings the Company nearer the end—submission to a revision of powers, or amalgamation. In the matter of value to an amalgamating Company, the London property is worth less now than it was last year; it is worth more now than it will be a twelvemonth hence. Every year that the Directors of the

London Company cling to their ten per cent. maximum, and debar themselves of more through fear of the sliding scale or reluctance to amalgamate, brings them nearer the time when their choice will have to be made, however reluctantly, between the two courses which all their neighbours have already taken. Will it be the former alternative—an independent existence under the sliding scale? Scarcely; the struggle for an initial price would not result in placing the Company on equal terms with the other Companies in this respect. Then there is only one other result to be looked for, and it must be left to the intelligence of the Governor and his fellow-Directors to say whether they are likely to make a better bargain at some future time, when they cannot help themselves, or in the immediate future, when they will still retain a voice to be heard and respected in any possible settlement.

The abstract of the accounts of the Manchester Corporation Gas-Works for the year ending the 24th of June last has been issued, and, as usual, sets forth the transactions of the department in great detail. The Gas Committee have suffered from the depression which pervaded the trade of Manchester during the past year, the number of gas consumers in their district showing a decrease, as compared with the previous year, of 1042, or 1·41 per cent. The increase in the consumption of gas has, therefore, been proportionately affected, being only 0·38 per cent., as against the preceding year's increase of 8·02 per cent. Although the coke sales suffered to the extent of £1780, the Committee have benefited by the lessened cost of coal and cannel, and have saved £13,000 under this head. Besides this they have realized £7700 more for ammoniacal liquor under a new contract in force during the latter half of the year. This looks as if the Committee are taking good care of their business, as well they may, in view of the demands upon them. First of all, they defray the entire cost of the street lighting, amounting to £23,336 for the year; and they have to hand over to the Improvement Committee the very extravagant sum of £52,000. Then the interest on loans has to be met, amounting to £23,629, and there are a heavy depreciation charge and a sinking-fund to provide for. All these charges, in addition to the ordinary working expenses, make the balance appear on the wrong side of the profit and loss account—a circumstance rather satisfactory to us than otherwise, as it causes the reserve-fund to be drawn upon, though to a comparatively small extent (about £1600), to make up the amount payable to the Improvement Committee. The reserve is not large—only £18,775—for a concern having to pay considerably over £112,000 per annum in what, in the case of a Company, would be dividends and interest, and there is no doubt that in this class of liabilities the Manchester gas undertaking is loaded quite heavily enough, even for its present magnificent income. The new Bradford Road station figures in the accounts as having absorbed, up to Midsummer, no less than £343,635, all of which is entirely unproductive, and most of it will remain so for a considerable time, as it has already been for some years. Not much is said of this particular station in the Committee's report, but the reasons for keeping the construction of the works so long in hand seem to require at least an attempt at explanation. The illuminating power of the gas has been maintained on an average equal to 21·32 candles, but the presence of sulphuretted hydrogen is not unknown, and, on the whole, it may be said that the purity of the Manchester gas has not been commensurate with its brilliancy. This is, of course, owing to cramped and imperfect apparatus, and may be expected to be remedied in the near future. Manchester has long been subject to a very disjointed system of control in the matter of gas supply; but there are signs that an improvement in this respect is not far distant. A responsible official head has been given to the engineering and manufacturing department, and this step alone should ere long be fruitful of good results.

The proposal to reduce the price of gas by an equal amount—twopence per thousand feet—within and without the city boundaries is, we would fain hope, an evidence that the Gas Committee are awaking to a sense of the positive robbery of their customers which they have been carrying on for so many years, by making them bear the whole cost of the improvements within the city, and, later, of lighting the streets. These two impositions, amounting together to about tenpence per thousand feet, cannot, in our opinion, be supported by cogent arguments, except the vicious if plausible ones of use and expediency—two specious cloaks which in other matters have been made to cover a vast amount of ancient error. Why an inhabitant of the neighbourhood of Manchester should pay about a shilling more for his gas than

is necessary, in order that Deansgate may be improved (?) or Piccadilly made to shine by night, is a query difficult to answer, except by the admission that the public authorities of the Free-trade city are obliged to resort to indirect taxation for a considerable portion of their corporate revenue. We own that the Gas Committee are not wholly to blame for this very unsatisfactory state of things. They probably do not reciprocate the fidelity with which the Improvement Committee cling to them, and would prefer to be accountable to their own customers for the profits they are able, by their skill and forethought, to realize. Popularity well earned is as dear to them as to any other of the chosen representatives of the ratepayers, most of whom are also gas consumers. But up to the present time they have sat down too tamely under the burdens laid on them by legislation of an obsolete type, instead of endeavouring to obtain independence with the aid of public opinion, which they might have taken more pains to foster, if necessary. We hope, however, that a new era is about to dawn for the gas consumers of Manchester, and that the Corporation will not long remain the great exemplar of all those purblind controllers of public gas undertakings who make the gas consumer a prey to all manner of extortion for the benefit of other people, and deny to him the consideration due to a ratepayer, and a brother.

The Town Council of Halifax have taken a most commendable step in the right direction, in reducing, by almost a third, the price of the gas supplied by the Corporation works. This action, of course, signifies that in Halifax the gas undertaking is in future to be worked for the benefit of the town, through the consumers, and no longer on the principle of aiding the rates by surcharging one section of the inhabitants. It is highly creditable to the Gas Committee, and to the Council who supported their recommendation, that they have had the courage to throw off the trammels of habit and surmount old prejudices, and by one act to proclaim their adhesion to the true principles upon which public property in gas should be administered. The Gas Committee will henceforth frame their annual estimates upon the basis of realizing, as nearly as may be, a profit of one per cent. only, the surplus, if any, to be credited to a stores account, which appears to be a form of floating capital. The immediate effect of this resolution will be to reduce the price of gas within the borough to 2s. 4d., as compared with the previous price of 3s. 4d. per thousand feet, and we shall not be surprised if the effect of this wholesale reduction prove to be the extension of the Committee's business beyond even their most sanguine expectations. The capital expenses of the Halifax undertaking are heavy in proportion to the consumption of gas, but this will soon be altered under the new dispensation. The works are equal to a largely-increased production, and there is now every prospect that their capabilities will be fully tested.

The Walsall Corporation are about to distinguish themselves by abolishing their borough rate for the ensuing quarter, ending next February. They intend to make up the deficiency in their corporate income by appropriating the sum of £7000, accumulated profits from the gas undertaking; the amount of the remitted rate being 1s. 3d. in the pound. It should be remarked that the estimated yearly profit of the gas-works is only £4000, the whole of which is handed over to the borough fund as a matter of course; but on the present occasion it will be seen that the undertaking is to be denuded of another £3000, accumulated surplus, in order that the ratepayers of Walsall may escape payment of rates for one quarter of a year. The decision of the Town Council to take the above-mentioned course does not appear to have been called in question by any one, so it may be supposed to have given satisfaction to everybody, for the time. It is not, however, to be expected that the gas consumers of Walsall will be better pleased than their fellows in other places, at being expected to pay rates for all the other inhabitants of the borough. There was a statement made by the Chairman of the Gas Committee, which gives us the impression that he, at least, is conscious of some imperfection in the means to secure the end favoured by the financiers of the Corporation. According to this gentleman, the district of Bloxwich, although charged sixpence per thousand feet more for gas than the price charged in Walsall proper, only returned about £500 to the gas department, while the same district would get back one-third of the £7000 bonus; in other words, Bloxwich contributes one-eleventh of the amount appropriated in lieu of rates, and receives in exchange one-third of it. When, in addition to this, it is considered that these amounts are probably contributed and

returned without the slightest relation being observed between contributors and recipients, it should be evident, even to the Town Council of Walsall, that there is a screw loose somewhere in their fiduciary arrangements, and that they are carrying on in a new shape the old game of robbing Peter to pay Paul. Meanwhile, people of an economical turn of mind may be led to consider Walsall a desirable place of residence, where the disagreeable infliction of rates can be escaped from, during some portion of the year at least, by the simple expedient of not burning gas.

The Stretford Gas Company are in trouble of an unusual kind. An inquiry into the affairs of the Company has been directed by the Salford Hundred Court of Quarter Sessions, upon the petition of certain consumers of the Company's gas, in accordance with the provisions of clause 35 of the Gas-Works Clauses Act, 1847, in which petition it was alleged, among other things, that the price charged for the gas was higher than it ought to have been. The Court appointed an Accountant in April last to examine the Company's books, and at a special sitting commencing last Wednesday the case was fully argued, upon the Accountant's report, before a Court presided over by Mr. W. H. Higgin, Q.C. The Company charge 3s. 6d. per thousand feet, and their gas has an illuminating power of twenty-two candles, so that, on the face of it, the consumers would not appear to have much cause for complaint. It is also made out, in the Company's defence, that the price is so low as to barely enable them to pay maximum dividends. Against this the petitioners contend that a reserve-fund should long ago have been formed to the full statutory amount, the interest on which would have helped to lower the cost of the gas; but that, instead of forming a reserve-fund with excess profits from time to time at their disposal, the Directors of the Company distributed these amounts among the Shareholders, by creating capital with them, and in other ways distinguished by more or less ingenuity in circumventing the provisions of the Act. To some of these allegations there was practically no defence, and, in fact, the best that could be done by the Counsel for the Company was to submit that the Court had no jurisdiction under the clause cited, which refers only to reserve-funds invested, and that as the Company had no invested reserve-fund at all, the provisions of the clause were inoperative. The Court postponed judgment until the 27th inst., after an expression of opinion on the part of the Chairman and another Magistrate that their power to deal with the matter was very doubtful. The whole proceeding is of considerable rarity, and if it should be decided in the present instance that the petitioners have no remedy, the curious spectacle will appear of a Company being successfully shielded from one provision of an Act of Parliament by the mere fact of having disobeyed another. By neglecting to observe clause 31 of the General Act, they may escape from clause 35; and as there is nothing expressly penal in the former clause it may be transgressed with impunity! If this be so, then, except a Company act straightforwardly and form a true reserve-fund with their surplus profits, nothing short of an opposition in Parliament will be of any service in regulating them as to price and profits, and even then they cannot be compelled to disgorge any illegal gains that a past generation of complaisant consumers may have permitted them to accumulate and divert to other uses than those contemplated by Parliament. The penalty, however, which an erring Gas Company would assuredly incur, as to their whole future existence, if, on applying to Parliament for further powers, malpractices of this kind could be proved against them, will probably be enough to deter, by anticipation, any Company from committing them. No Company under parliamentary control could carry on frauds of this nature except with the positive connivance of the public, which is simply impossible; and we should think that few would attempt anything of the kind. As to the particular case in point, we cannot, of course, express an opinion until the decision of the Court has been made known.

In a communication which appears in another column, Mr. George Livesey opens up afresh the question of high yields of gas from coal as compared with moderate rates per ton, with regard to their respective economy. The point as to the determination of the highest rate to which a given coal can be forced in carbonization, with due regard to the conflicting advantages of quantity, quality, and economy of working, is well made, and should secure general attention. That there is a maximum to be attained, if possible, but never exceeded, is evident upon the merest glance at the problem; but whether the advocates of the highest or lowest results commonly recorded are nearer the correct proportion,

certainly needs settlement, or, at least, such attempts thereat as Mr. Livesey's challenge should be competent to evoke.

Mr. J. T. Jolliffe's paper on the "Utilization of Waste Heat" from the Retort-Flues for the Generation of Steam," read at the recent meeting of the North of England Gas Managers Association at Sunderland, was useful for its incidental information respecting the expenditure of fuel in producing steam for the ordinary operation of a gas-works, as well as for the narrative of the author's experiences in arriving at the proper position and setting for steam-boilers to be heated from the main flue of a retort-stack. It seems a somewhat strange proceeding to put a boiler into a spare arch, and then to bring down the heat to it from above, as first arranged by Mr. Jolliffe, and there can be small wonder that he found the draught from the settings to be deteriorated thereby. The top of the bench is certainly the best place for a boiler intended to be heated by the waste heat of the retort-settings. It is, however, curious that the author, having condemned a previous proposal to fix boilers in this position, on the ground of their inaccessibility, when through settings are in question, should, in his very next paragraph, admit having followed the same course with success, when he required additional steaming power. There is an apparent discrepancy here between the author's opinions and his practice, which is, we are sure, apparent only; but, as expressed in the language of the paper, the point of reconciliation is not very clear.

Dr. Williamson, the Chief Gas Examiner for the Metropolitan Board of Works, has issued his report on the quality of the gas supplied during the three months ending the 30th ult. by The Gaslight and Coke Company, the Commercial Gas Company, and the South Metropolitan Company. In all cases the illuminating power of the gas was considerably above the requirements of the Acts of Parliament. Sulphuretted hydrogen has not been present in the gas, and the proportion of sulphur in other forms never averaged fourteen grains per hundred cubic feet, and was generally much lower. This is, of course, considerably below the prescribed limits. Ammonia has been present to a slight extent at all the testing stations except Becton, but always far below the maximum allowed. We would respectfully recommend these figures to the attention of Sir George Campbell.

Water and Sanitary Notes.

MR. MORRISON'S motion with reference to the London Water Supply, which was to have been brought forward at the meeting of the Court of Common Council last Thursday, but which was lost sight of amid other exciting topics, is now upon the agenda for next Thursday week. The proposition is that "engineers and others" be invited to send in plans for supplying the Metropolis with water, presumably on some better system than that which now exists. A plan or a "mode" will do, and premiums are to be given by way of encouragement. Such, at least, is the proposal, if the Common Council see fit to adopt it. We should hardly think that the Corporation will care to take such a step. The City is not the Metropolis, and within the civic boundaries the arrangements with regard to the water supply might serve as a model for the rest of London. Certainly the Corporation have taken the lead in making the best use of the supply placed at their disposal, and if the authorities elsewhere would do the same, there would be no need to invoke any further engineering help. As for plans and "modes," there are plenty of them already. If the Corporation choose to amuse themselves with giving away money for fresh schemes, we presume they have the right to do so, but we cannot suppose that the Metropolis will be any the better for it.

The Vestry delegates are understood to be putting on their armour anew for the fight in respect to the Water Supply of the Metropolis. It has been announced that they are "summoned for an early date," to consider what they shall do. It is reported that they are going to "prepare representations" to the Home Secretary, confident that the Home Secretary will be prepared to receive them. Possibly Sir William Harcourt may care less for the delegates' invective now than formerly. The scheme of Sir Richard Cross is quashed, and that is enough, though the Vestry delegates may be slow to perceive it. All the troublesome and intricate questions about the water supply are to be handed over for the consideration of the forthcoming Trust, and the Home Secretary no longer wants anybody to tell him what he had better do. No doubt, the delegates will meet and talk, and will fancy they are shaking the spheres. But the question has slipped

out of their fingers for the present; and perhaps the Vestries will find it necessary before long to take steps to secure their own existence.

The public are reminded that if ever the New River Company have to give place to a Water Trust or other immaculate institution, the Company will still live and prosper. This corporate body is really a land and water Company, and if the water be taken away, the land will remain. There are whole streets and squares on the New River estate, leases are falling in, and the property is rising in value. The land not yet built upon is also going up in the market, and the prospect altogether is understood to be highly encouraging. If the water rights are transferred, of course the Directors will give their undivided attention to the subject of houses and lands, and will do their utmost to make them productive. For the present they have two strings to their bow, and can await the coming session with philosophic calm.

The Derby Water-Works Company have held their final meeting. True to their instincts, the Corporation have dealt ungraciously with the Company in their manner of carrying out the agreement for the purchase. A Water Company is expected to show a spirit of self-abnegation and liberality; but a Town Council is exempt from any such obligation, and may demand the pound of flesh on the plea that it is for the good of the ratepayers, whereas if the Directors of a Water Company ever propose anything for the good of the Shareholders, it is looked upon as public robbery. The Chairman of the Derby Company, in his parting address to his constituents, referred incidentally to the rather curious visitation which has just befallen the Corporation. "A Nemesis had overtaken them," in the shape of "some demented bellman," who went round the town denouncing the water supplied to the inhabitants. Had the supply been still in the hands of the Company, the bellman might have roared himself hoarse in decrying the quality of the water, and the Corporation would rather have applauded his zeal than otherwise. But a change had taken place which the bellman failed to appreciate. Influenced, perhaps, by his early education, he declared the water unfit to drink, but awoke to find he was behind the age. The water now belonged to the Corporation, and was consequently very good indeed. The Borough Analyst was referred to, and he declared that the water was absolutely free from all suspicion of impurity. The Corporation were ready to hang the bellman—that is to say, they suspended him, and we have not yet learned the issue. So it comes to pass that the Derby Water-Works Company walk off the scene with a clean bill of health in their hands, signed by the Corporation's scientific chemist.

The Manchester City Council have not yet come to the end of the case concerning Mr. Berrey and the late irregularities in respect to the water-works accounts. At the meeting of the Council, last week, the Water-Works Committee presented a report recommending that Mr. Berrey's duties should henceforth be limited to the superintendence and management of the indoor department, and that his salary be reduced from £1000 to £800 per annum. This reduction might be supposed to correspond to the reduction of his duties, the outdoor superintendence being otherwise provided for, as was originally the case. Mr. Berrey seems to have had too much to do, and the whole department has apparently been loosely conducted. Some amount of personal feeling shows itself in the investigation of this affair, and the report of the Committee—not the first that has appeared on the subject—was discussed with much animation at the recent meeting. After a prolonged debate, the report was referred back to the Committee for further consideration, on the ground that it was not sufficiently explicit. The votes on the subject were nearly equal, a strong minority being in favour of the adoption of the report.

The Ninth Annual Report of the Local Government Board has just made its appearance. It is a bulky volume, and we shall proceed to discuss its highly varied contents next week. In the meantime it may be of interest to state that the Urban Sanitary Authorities have in the course of the past year added more than twenty per cent. to the amount of their loans, the total sum being now considerably above fifty-six millions, or seven millions more than the aggregate value of the districts. The report contains the observation that, so far as this debt has been incurred in connection with reproductive works, "and especially in respect of gas and water undertakings, it constitutes an apparent rather than a real increase in the burdens imposed on the ratepayers." But it is added that this depends on the assumption that the works do not cost an excessive sum, and that the financial arrangements are of a judicious nature.

The "Amendment of the Sanitary Laws with reference to Buildings" was the subject of a long and animated discussion at the Social Science Congress held last week in Edinburgh. The architects were emphatically denounced by Dr. Alexander Wood, who gave some frightful examples of their misdoings, and proposed that they should be "punished" for constructing houses which were afterwards found to be fatally defective in respect to the drainage. Dr. Wood declared, of his own personal knowledge, that "some of the most infamously constructed houses in the country were constructed by architects who had passed all the necessary examinations." The "fixing of responsibility" in this, as in some other matters, is rendered difficult by the fact that the responsibility would have to be fixed in high and respectable quarters. There is no saying who might be sent to prison.

"Sanitary protection" is invoked with reference to dwelling-houses. It is alleged that most of the houses in the new part of Edinburgh are free from sewer gas, owing to the sanitary supervision exercised by the voluntary association formed in that city. The members of this society can have their drains inspected by a competent officer, who advises as to the proper measures to be adopted. But, according to the statement of "A Physician," there is another agency at work in Edinburgh, in the shape of the Burgh Engineer, whose services are at the call of every ratepayer as occasion may arise, and who makes, either personally or by some competent representative, an examination of all premises alleged to be in an unsanitary state. The defects, if any, are notified to the landlord, and if that person fails to make them good, the Burgh Engineer has the work done, charging the landlord with the expense. Theoretically we believe there is a similar power resting with the London Vestries, but it is only carried out with reference to the poorest class of houses, and even there by no means generally. House inspection is now demanded for the higher class of property, which is sometimes sorely in need of it.

Sewer ventilation still undergoes discussion. One gentleman suggests that the Local Government Board should refuse their sanction to any plan for the drainage of a town which does not provide properly for the ventilation of the sewers. The advice is good, providing the Local Government Board themselves know how the ventilation is to be effected. Another gentleman contends that sewers might be safely ventilated by means of gratings in the roadways, if the sewers were properly constructed so as not to retain any deposit. If the sewers are not properly laid down and duly flushed, we are warned that not even the best system of ventilation can put matters right. Another disputant views with alarm the prospect of ventilating-pipes from the house drains being carried up to the top of every building, and warns the inhabitants of the Metropolis as to the risk of being suffocated by "filthy fogs," when to the smoke of a million chimneys there shall be added the stench of a hundred thousand drains, for he assures us that when the smoke comes down from the chimneys, so also will the sewer gas descend from the house-tops. He proposes, therefore, that the gas should be deodorized.

The health of the Parisians is about to be cared for after a fashion which, however desirable it may be in London as well as in Paris, would scarcely be tolerated anywhere on this side the Channel. The authorities of the French capital—so it is reported—moved by sanitary considerations, are about to put in force certain old laws with reference to the keeping of domestic animals. An inspection is shortly to be made involving a species of census of cats, dogs, birds, and other domestic pets, and regulations are to be enforced as to the number of these animals which each house is to be allowed to keep. For the sake of peace and quietness we might be glad of some such system in London; but we have only gone so far as to put a tax on dogs, though a like impost on cats has been frequently advocated. We half suspect that this professed regard for the health of the people dwelling in Paris is an ingenious excuse for killing the cats. Perhaps it is also designed to divert the inhabitants from a more serious apprehension of certain defects in the matter of drainage. A foray on domestic pets is a curious sequel to the recent outcry about unsanitary odours in the French capital. After all, it is easier to go to war with cats and dogs than with germs. As Dr. Letheby might say if he were living, the former can be seen, while the latter cannot.

REDUCTION IN THE PRICE OF GAS AT PLYMOUTH.—The Plymouth and Stonehouse Gas Company have announced a reduction in the price of gas to 2s. 1d. per 1000 cubic feet, to date from Michaelmas last.

THE GLASGOW EXHIBITION OF ARTIFICIAL LIGHTING APPARATUS.

SECOND NOTICE.

Messrs. Edmundson and Co., of London and Dublin, principally conspicuous as the manufacturers of the Wigham lighthouse burners in use in various parts of the hall and grounds, occupy besides a stand whereon various applications of the alcoh-carbon lamps are shown. These tolerably well-known articles are the only examples contained in the exhibition of means whereby the illuminating power of gas can be increased by what may be called chemical action as distinguished from the physical effects produced by burners. There are two stands (bearing the names of Mr. Love, of Johnstone, and Messrs. J. and W. Weems, also of Johnstone, near Glasgow), at opposite ends of the hall, at which dazzling reflectors and polished balls mirror bright gas-jets in a manner which, although somewhat "circus"-like and hollow from a scientific standpoint, attracts much public admiration. Messrs. Faraday and Son, of London, show a single ventilating gas pendant of good construction, and nothing more. It is, in fact, noticeable that the ornamental parts of gas-fittings—the chandeliers, brackets, and standards—which the gas-consuming public have perhaps more frequently before them than any other outward and visible sign of gas as a lighting medium, are not at all so conspicuous as they should be in this exhibition. There are, of course, many scattered specimens of these appliances at the stands of different exhibitors of burners, &c., and there is one large stand of figure-lamps and elegant goods of the same class belonging to Messrs. J. Finlay and Co., of Glasgow, as agents for Messrs. Zimmermann and Co., of London; but beyond these there is no show such as two or three brassfounders and metal-workers of eminence in this line could have contributed, had they been so disposed.

Street-lampstandards are shown by Mr. D. M. Nelson, of Glasgow as manufactured by Messrs. W. and T. Allen and Co., of London; and devices for lighting gas by electricity, suitable for large halls, &c., are exhibited by the Messrs. Lennox, Lange, and Co., of Glasgow, Messrs. D. and G. Graham, of Glasgow, and the Science and Art Department, South Kensington. Messrs. Carnaby, of Glasgow and London, are also present with their useful and well-known apparatus for regulating, by the main cock on the consumer's meter, the admission of gas to any required consumption.

Turning now to the various stands whereon gas-stoves for cooking and heating are shown, we shall find a sufficient variety of these appliances to thoroughly exemplify the use of gas in both departments of utility wherein heat is more than light is required. First in order comes the very pretty metal-ceramic tiled bath, heated by gas, shown by Messrs. Kean and Wardrop, of Glasgow, which is most invitingly fitted up, and is apparently heated without difficulty. Then comes a simple circulating boiler, by Messrs. Wallace and Martin, of Glasgow; and next is to be found the somewhat important stand of Messrs. Ewart, of London, who show several baths and water heaters of the "instantaneous" description, wherein the water is turned on cold at the top and runs off hot at the bottom of the heating apparatus. Messrs. Boyd and Sons, of Paisley, show some examples of the usual kind of greenhouse or corridor warming coil-pipes heated by gas, and lead us up to the stand of Messrs. W. Harvie and Co., of Glasgow, who show several examples of Dr. Adams' new patent heating stoves, and one of the same inventor's new cooking stoves, now first exhibited. The construction of these stoves has already been explained in the JOURNAL [See Vol. XXXV., p. 634]; but it may be mentioned here that the stoves attract much attention from their novel shape and principle. The burner by which the heat is developed is decidedly new and ingenious, and the courses of the heated currents of air are cleverly contrived. Dr. Adams proposes to do the entire work of his cooking stove by the heat of one gas-burner, just as a coal-stove works with only one fire; and there can be no doubt that he succeeds in getting, from his special burner, a well-divided heat suitable for carrying on several operations at once. Whether or not this end is really worth an effort to attain is another matter, and one which can only be settled by experience, and by strictly comparing the new stove with others, weight for weight. Gas-stove makers who follow, with but small deviation, the well-known lines on which gas-stoves of ordinary construction are built, contend that the apportionment of separate burners to the independent works of roasting, baking, or boiling, which is a common feature of most gas-stoves, is their chief recommendation; and that the fact of an ordinary coal-fire range requiring its full power to be exerted to enable it to do anything at all, is one of the principal reasons why the multiple-fired gas stove, burning a more costly fuel, can compete with it on equal terms. Dr. Adams has been very successful with his heating stoves; whether he will be equally so with his cooker remains to be proved. As we have already said, it is well designed and carefully thought out; it must now be shown that it will cook as well and as conveniently as any other stove, and with less consumption of gas.

The heating stoves, of which there are several kinds shown, differ perhaps more widely in design than do the various cookers. Messrs. John Wigglesworth and Son, of Nottingham, show several examples of Gillingham's patent heat radiator, which is an apparatus constructed on the same principle as Mr. Vernon Harcourt's arrangement for warming a small greenhouse, described by him at the late meeting of the British Association of Gas Managers. Gillingham's apparatus is therefore a true radiator, composed of a horizontal cylinder of sheet metal supported at each end by a smaller vertical pipe. In the centre of the cylinder another vertical pipe descends to a gas-burner, and takes up the hot products of combustion, which give out their heat in the cylinder, and finally escape downwards by the end pipes. The whole arrangement is as simple

as can well be devised, and must be effective to the extent of its range, which is not unlimited. Another very useful and decidedly original gas heater is the Argand arrangement of Messrs. Ritchie and Co., of London, which is oddly like a magnified pressure-gauge with central tube; the centre being the burner, and the side pipes giving out warmed air. Messrs. Farwig and Co., of London, have also a stand for showing George's gas calorifier—another stove for heating air. There are other air-heating stoves exhibited by Messrs. Shaw, of Glasgow, Messrs. Stark and Co., of Torquay, and others. But we cannot award unqualified praise to the principle of these hot-air stoves. A good radiating gas-stove is wanted, if gas is to really take the place of coal in living-rooms, and there are not wanting attempts to supply this desideratum. Mr. C. Wilson, of Leeds, is well forward in this respect with a handy little stove for fixing in the place of an ordinary fire-grate, or hanging in front of it, in which an atmospheric burner heats a vertical fire-block covered with wire netting, and this in turn radiates heat into the room, while the products of combustion go up the chimney. The principle is also applied in a separate form, independent of a chimney or grate. It is needless to say that the so-called "Cheerful" stoves, which reflect the radiant heat from a line of gas-jets, and the variously modified gas fires—lumps of fire-clay and pieces of asbestos arranged in feeble imitation of a coal or wood fire, and heated by more or less cunningly concealed gas-jets—are both shown at several stands. These objects are not strange, and call for no special mention.

Gas cookers are in great force. Mr. C. Wilson, of Leeds, shows a number of the efficient close stoves for which he is celebrated—strongly made, not particularly ornamental perhaps, but still adapted in all respects to family use. It should be remembered Mr. Wilson's oven and roaster is in one, and heated by atmospheric burners in the bottom. This arrangement permits of a large joint being cooked when required—at the sacrifice, of course, of the upper shelf space otherwise available for pies, &c. Messrs. Beverley and Wyde, of Leeds, show several large stoves of very good construction. Their oven is also heated from beneath by an enclosed atmospheric burner, and in some examples is lined with white tiles. The stoves of these two makers may be taken as the type of many others—the enclosed burner, large oven, &c. In one stove, Messrs. Beverley and Wyde make the rest for kettles or pans, over the boiling stoves on the top, of a pipe bent into several returns, which being connected with a water cistern, forms a circulating arrangement for heating water. The use of atmospheric burners for giving the radiant heat needed for roasting is not to be commended on theoretical grounds, as we know that ordinary gas-jets give more radiant heat than Bunsen burners. The reason sometimes offered, that the openings of the atmospheric burners are larger, and not so easily choked as those of a common jet, although fairly sensible, does not explain the persistent use of inferior means to attain the required end. The best means of producing heat should be adopted, and any risk of accidental fouling should be guarded against by proper means. Messrs. Stark and Co., of Torquay, whose energy in sending their goods such a long distance deserves a reward, show articles on quite a different principle. Their stoves are heated from without, by ordinary burners applied to a kind of channel which delivers hot air into the oven. Ovens thus heated naturally require a somewhat longer time to get ready for cooking, but when fairly started they are easily kept hot. The fact that all the gas required for heating is burnt outside the oven, is probably a good point in Messrs. Stark and Co.'s favour with fastidious customers. Messrs. Billing and Co., of London, represent another principle of gas roasting in their examples of "reflector" cookers, which are distinguished by all the roasting being done by reflected heat from ordinary gas-jets situated above the meat, the roasting compartment being freely exposed to air in natural circulation. The same gas-jets heat the close oven, which is quite distinct from the roaster. Messrs. Billing and Co.'s manufactures are very neat and well finished, and attract much notice. The "Retort" cookers, which come to us from across the Atlantic, are shown by Messrs. P. and R. Fleming and Co., of Glasgow, and although well constructed, are not, perhaps, calculated to revolutionize the gas-stove trade. Messrs. J. Finlay and Co., of Glasgow, show specimens of stoves manufactured by Messrs. S. Leont and Co., of London; and Messrs. A. Shaw and Son, of Glasgow, have some stoves of Messrs. Wright and Co.'s, of Birmingham, neither firm of makers having special stands of their own. The Argyle Ironmongery Company, of Glasgow, show a variety of well-made stoves, two of them being of considerable dimensions, and fitted for coal and gas in combination. Messrs. Chalmers and Son, of Glasgow, show a number of stoves made by Messrs. Siddaway and Co., of West Bromwich, which are low-priced and serviceable. It may be said with so many varieties of gas-cookers on view, that if an intending purchaser should by any chance leave the hall unsatisfied, it will be due rather to his own vacillation between many suitable patterns, than to any lack of satisfactory goods.

Mr. Fletcher, of Warrington, contributes a series of first-class burners for laboratory use, including examples of portable gas furnaces for crucibles, muffles, ladles, and other purposes, and also various kinds of blowpipes. Mr. Fletcher's exhibit is a complete demonstration of the manifold utility of gas in the laboratory of the chemist or metallurgist. Messrs. Verity Bros., of London, show various applications of their fire-clay burners for cooking, boiling, &c., and also some apparatus for ventilating sewers or buildings in connection with the use of gas-lamps, which appears to act remarkably well.

Among the more miscellaneous appliances for utilizing the heat of gas may be noticed the somewhat curious arrangement for heating laundry irons with a blast, shown by the queerly-named Air Burning Company, of Glasgow; and the different arrangement, with the same

object, of Messrs. F. Rath and Co., of London. Both manufacturers aim at keeping the irons constantly hot while in use, by gas-flames continually burning within them. The Sanitary and Domestic Appliances Company, of Manchester, exhibit a multitude of ingeniously made articles, such as gas fire-lighters, gas-heated irons for laundry work and for silk hats, gas-lighting torches, &c.; and Mr. W. H. Hilton, of London, has a number of goods of a similar description, and remarkably low in price.

In the department of gas motor machinery there is not much real competition. The Otto gas-engines, of which there are two, of 8 and 4 horse power respectively, manufactured by Messrs. Crossley Bros., of Manchester, have it all their own way as to examples of powerful machines. The larger is intended to drive the magneto-electric machines for ten electric lamps supplied by Messrs. Stodge and Co., of London, a firm here principally represented by electric lighting apparatus, but more generally known as gas-fittings manufacturers; and the smaller actuates another dynamo machine employed by Messrs. Thomas Smith and Son, of Glasgow, in the work of electro-plating, shown by them in operation. The "Bischoff" vertical gas-engine is shown by Mr. J. Brownlee, of Glasgow, as manufactured by Mr. Andrew, of Stockport, in sizes up to 3-horse power. Messrs. Thompson, Sterne, and Co., of Glasgow, also have a stand for showing a Clark's gas engine, and one of Ericsson's new hot-air pumping-engines, worked by gas. This novel engine, the first of its kind exhibited in this country, is an American production of most ingenious construction, as might be inferred from the name of its illustrious inventor. It is remarkable, among other reasons, for using the same air over and over again, expanded by heat, and subsequently cooled by a water jacket; but its details would require more space for explanation than can be spared here. It may be remarked that the extraordinary petroleum engine, shown by this firm at the Royal Agricultural Society's Kilmarnock Exhibition last year, does not make a re-appearance at Glasgow. Altogether it may be said that the reputation of gas as a motive power is well maintained at Glasgow, though with few examples. We must not omit to notice that Wigham's fog-horn, sounded by gas power, is very conspicuous in the exhibition, or rather in the neighbourhood, which resounds at intervals with its penetrating, if rather unpleasant tones. The inhabitants of the vicinity of the Great Western Road will probably long retain memories of its remarkable powers.

Several exhibits of the products derived from gas-tar and ammoniacal liquor, of a thoroughly representative character, distinguish this exhibition most appropriately, considering the locality, Glasgow being world-famed for its chemical manufactures. Of these the splendid case belonging to Messrs. Burt, Boulton, and Haywood, of London, is most conspicuous. Commencing with the unpromising-looking raw materials, this case contains the first series of the products of the distillation of tar, consisting of crude naphtha, creosote, naphthalene, anthracene oil, and hard and soft pitch; then we have the benzol and toluid series of products from the crude naphtha, prepared for the manufacture of the aniline colours. Carbolic acid, nitro-phenol, and cresylic acid form a distinct group; and naphthalene in various forms is also shown, some of the pure material being in crystals two inches long. Anthracene is also exhibited, the beautiful fluorescence of the pure article, crystal and liquid, being very remarkable, the latter being in the form of dichloranthracene-disulphonic acid. Messrs. Burt and Co. carry out the manufacture of alizarine, or the material which has supplanted madder as a dye, more completely than any other product, and specimens of "Turkey-red" dyed with their alizarines are calculated to give, in the contemplation, more pleasure to gas-tar manufacturers than to the proprietors of madder farms, or the importers of that material. The German manufacturers of aniline dyes are represented by Mr. J. A. Dixon, of Glasgow, in a neat exhibit including a sample of the artificial indigo recently discovered, after years of experimental research, by Professor Adolf Bafey, of Munich, which is in all probability destined to give a death-blow to the indigo cultivation of India. With a notice of the stand of coal tar and ammoniacal liquor products manufactured by the West of Scotland Chemical Company, of Maryhill, shown by Messrs. Archibald Arrol and Sons, of Glasgow, which look particularly clean and good, our notice of the exhibits of gas and its derivatives and accompaniments at Glasgow must close.

We may add that the ventilation of the hall, alluded to in our first notice of the exhibition, has since been made perfect.

Notes.

[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

HALF A CENTURY'S PROGRESS IN THE GAS SUPPLY OF LONDON.

In the "Repertory of Arts," &c., for the year 1832, some interesting statistics are given respecting the gas supply of London at that period. It is stated that the gas by which the Metropolis was then illuminated was produced by the consumption of something like 38,000 chaldrons, or 48,450 tons of coal per annum. The gas produced from this bulk of raw material was used in the supply of 62,000 gas-burners in shops, private houses, &c., and 7500 street lamps. Two years previously—namely, in 1830—there was in the soil a total length of mains of over 1000 miles. The same authority states that "gas lights of half an inch in diameter supply a light equal to 20 candles; of 1 inch in diameter, a light equal to 100 candles; 2 inches, 420 candles; 3 inches, 1000 candles." It is to be regretted that the writer in the "Repertory" did not give some particulars

as to the amount of capital employed in furnishing the metropolitan gas supply at the period alluded to, and of the dividends paid upon it, as these would have afforded scope for some interesting comparisons to be made in reference to the present position of the gas industry in London. Two of his items may, however, be taken for this purpose—the number of tons of coal carbonized, and the number of public lamps supplied—and when they are placed side by side with similar items furnished by the last accounts presented to Parliament by the Metropolitan Gas Companies, the difference in the figures is somewhat startling. According to these accounts, about 1,370,000 tons of coal were consumed for gas-making purposes in the course of the year 1879, and the gas made from this bulk of raw material, rather over 16,533 million cubic feet, was supplied to private consumers, and about 1104 millions by contract and to the public lamps, of which there were 69,800 in use on the last day of that year. Taking the usual consumption of a private light, the first-mentioned total would show that there were over 4 million gas-burners in use in the houses of the Metropolis nine months since, and of course the number is now larger. The total capital employed in furnishing gaslight in London was, on Dec. 31 last, close upon £12,700,000, which last year earned a profit of £1,163,077, being at the rate of about 9 per cent. on the capital employed, and 38 per cent. upon the gas-plant. With regard to the length of mains, it is sufficient to say that those laid in the district of one of the Metropolitan Companies alone exceed by 50 per cent. the entire length of piping beneath the streets of London at the time the note in the "Repertory" was penned. Such, very briefly stated, is the progress made by the gas industry in the Metropolis in the course of the past half century.

THE SUBSOIL OF PARIS.

According to a communication made by M. Henri Sainte-Claire Deville to the French Academy of Sciences, the subsoil of Paris possesses a curious composition. The quantity of water impregnating 2530 kilos. of soil, or mud, may be estimated at half a litre, holding about 25 to 30 grammes of salts in solution, the liquid being therefore highly charged; the cause whereof is thus explained:—The subsoil of Paris not being drained, the paving-stones and spaces between them become impermeable as soon as their surface is wetted. When these spaces become dry the subsoil water evaporates, and thus gets concentrated, until the rain water and the watering-carts wash down all kinds of soluble and organic matter, and soaking into the spaces between the paving-stones, render the surface impermeable afresh. The water contained in the underlying black mud is thus continually being saturated. Again, it receives the particles of iron worn away from the shoes of horses and the tires of carriage-wheels, considered by M. Chevreul to be the cause of the iron compounds found in the soil, and of the black coloration of the mud itself. Moreover, the escapes of gas from the street-mains, estimated at about one-tenth of the total quantity of gas in circulation through them, have added quantities of sulphur, hydrocarbons, and tar, which are abundantly found in the soil of Paris. The action of this tar is described as beneficial, for, in consequence of the antiseptic qualities of the phenic acid which it contains, all fermentative action in the other ingredients of the black mud below the streets of Paris is supposed to be prevented. The odour arising from the mud is therefore but slightly contaminated with sulphuretted hydrogen, not more objectionable than the atmosphere pervading many mineral water springs—which, however, is not saying much in its favour as a perfume—and is also slightly empyreumatic, a smell as healthy in its effects as the emanations from the various gas-works in the environs of Paris, to which patients suffering from certain epidemic affections, notably whooping-cough, are sent for relief. Therefore, according to M. Deville, the Paris Gas Company, among other things, materially contribute towards the sanitation of the city.

THE EXPANSION AND COMPRESSIBILITY OF GASES.

There were published in a recent number of the *Comptes Rendus*, the results of recent researches by M. Amagat on the expansion and compressibility of gases under strong pressures, the following laws being deduced:—1. The coefficient of dilatation of gases increases with the pressure up to a maximum, then decreases indefinitely. 2. The maximum occurs under the pressure with which the product p is a minimum, where the gas accidentally follows Mariotte's law. 3. It diminishes with higher temperatures, and finally disappears. 4. At a sufficiently high temperature the compressibility of fluids is represented by the formula $p(v - a) = \text{const.}$; a being the smallest volume the mass of fluid can occupy. This is the limiting law. For each gas a has a special value. 5. For pressures below the critical point, the deviation from Mariotte's law, first positive for a temperature sufficiently low, becomes nil; then negative, with increasing temperature; but beyond a certain negative value it diminishes indefinitely without changing sign. 6. For pressures between the critical pressures and a superior limit, special for each gas, the period during which the deviation is positive is preceded at a lower temperature by a period in which it is negative; so that the deviation twice changes sign. 7. Beyond the upper limit of pressure indicated in the preceding law the deviation is always negative, whatever the temperature. It diminishes, in general, when the temperature increases, except for pressures near the limit, where its variation is more complex.

PHOSPHORESCENT LIGHTING.—Dr. Phipson, says *Les Mondes*, takes sulphide of barium, or some other substance which is rendered phosphorescent by the solar rays, and encloses it in a Geissler tube, through which he passes a constant electric current of a feeble but regular intensity. He claims to obtain in this manner a uniform and agreeable light, at a cost lower than that of gas.

Communicated Article.

IS A HIGH YIELD OF GAS PER TON OF COAL CARBONIZED AN INFALLIBLE TEST OF GOOD MANAGEMENT?

By Mr. GEORGE LIVESEY,

Secretary and Engineer of the South Metropolitan Gas Company.

The interesting articles by Mr. H. Leicester Greville, on the amount of light naphtha in coal tar and its illuminative value, which were recently published in the JOURNAL, invite attention to a question of some importance to gas managers and to gas companies and corporations owning gas-works. It seems to be assumed that a high make of gas per ton of coal is indisputable evidence of good working, reflecting credit on the manager, and bringing profit to the undertaking. It is, therefore, one of the usual things for the chairman at a meeting of shareholders to make a great flourish of trumpets over a make of, say, 15,000 feet of gas per ton of Newcastle coal carbonized; but he never tells his audience the cost at which this result has been attained—probably supposing, and certainly leading his hearers to suppose, that the increased yield has been obtained without any increase of cost whatever.

If the increased yield is brought about by the prevention of leakage from the retorts, or the removal of the dip, or the prevention of oscillation and the working with a steady level gauge, or by improvements in charging, or more regular heats, while all other conditions remain unchanged, the additional make per ton—provided the illuminating power be not reduced—is a clear gain. Supposing, however, that the additional make is the result of harder firing—which is usually the main element in producing an enlarged volume of gas—then it is not a clear gain by any means.

It is well known that when the economical maximum is attained, the cost of going beyond that point increases in a very rapid ratio until the gain, however great, is more than counterbalanced by the cost of obtaining it. This is strikingly illustrated in the speed of steamships, and the same principle must apply to gas-making.

If an extra 500 feet of gas per ton of coal carbonized is obtained by higher heats, experience shows that the quantity is increased at the expense of the quality. It appears from Mr. Greville's investigations that the quantity of light naphtha found in the tar is very nearly sufficient—if entirely absorbed by the gas—to add one candle to the illuminating power, or to prevent its reduction to that extent. As this, however, does not appear to be the case, it is probable that high heats have but little effect in transferring the light naphthas from the tar to the gas. If they were transferred, a valuable constituent would be taken from the tar, thus reducing its value, and causing a loss on the tar approaching, if not quite equal to the gain on the gas. "You cannot eat your cake and have it."

Seeing that an extra 500 feet per ton is an item that stands out clearly, whilst the items on the other side are to a great extent wrapt in obscurity, and of unknown value, it is not surprising that the one should have been brought prominently forward and the others overlooked or forgotten.

It is very desirable that some attempt should be made to ascertain the economical maximum make of gas per ton, and to this end the following *pros* and *cons* may be suggestive, and lead to the necessary experiments that should be undertaken to clear up the doubtful points. It is quite open to any one to set his value on the various items in the annexed statement:—

Statement based on the Comparison of 9800 Feet of 15½ Candle Gas against 10,300 Feet per Ton of Newcastle Coal in London.

Estimated reduction of illuminating power at least half a candle, requiring 3½ per cent. of canal, producing 30-candle gas, to make up the deficiency of light, the extra cost of the canal and the diminished value of its coke will add from 10d. to 1s. per ton to the cost of coal, say	0s. 10d.
Extra fuel estimated at least 10 per cent.	0 2
Less tar produced, estimated 1 gallon	0 2
Increased wear and tear of retorts and trouble with stopped pipes, say	0 1

Deduct— 1s. 3d.

An increase of 5 per cent. in the make per ton is equivalent to a saving of 5 per cent. of carbonizing labour, which, according to Mr. Field, is rather less than 2d.

5 per cent. less of retort-houses and retorts for the same amount of work effects a saving of plant, which at 10 per cent. interest amounts to 1d. —

Os. 3d.

Difference 1s. 0d.

If this is correct, it appears that the net cost of producing an extra 500 feet of crude gas is 1s., the said gas being not worth more than 6d. in the retort-house.

Can this be even approximately correct? If so, these vaunted high makes per ton, where canal has to be used to keep up the quality, are a great mistake, and even where the reduction of quality is of no consequence, and canal is not required, the 6d. worth of gas is not by any means obtained for nothing.

The object of the writer for many years has been to produce, with the smallest amount of canal, gas of the required quality of 16 candles, being content with a make of 9800 feet per ton. Experiments are about to be made for the purpose of ascertaining the point at which it ceases to be economical to increase the make per ton; and it may be found better to produce only 9500 feet or so without

canal, than any larger quantity with the addition of that expensive article. The result of those experiments shall be placed at your service, and if others will give to your readers the benefit of their experience on this important question, even if it goes to prove that the writer is altogether mistaken, no one will be more pleased than he to see a satisfactory conclusion take the place of the present uncertainty.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE DISTILLATION OF COAL TAR.

SIR,—I have read with some degree of interest, in the JOURNAL of the 6th inst., the specification of Mr. G. C. Trewby and Mr. H. W. Fenner for improvements in the mode of distilling tar by steam and perforated internal pipes. I must say I was rather astonished to see, at this date, that they had been at the trouble and expense of patenting a process for heating, boiling, or distilling coal tar, which was known and adopted by my father, who was a tar distiller, many years ago.

It may not be out of place for me to state on my own account that for a certainty I assisted, under my father's directions, in erecting a tar still—not a circular one as illustrated in fig. 2 in the specification, as it was a longitudinal boiler, but shaped the same in the bottom as represented in fig. 1, and the only other perceptible difference I can see is in the outlet, the dome or stand pipe of which stood 3, or perhaps 5 feet high, as near as I can remember, on the boiler, erected upwards of 30 years ago, and which I now refer to.

Oct. 6, 1880.

A. FORD.

THE GLASGOW EXHIBITION OF ARTIFICIAL LIGHTING APPARATUS.

SIR,—In your notice of the above-named exhibition, commenting on the goods exhibited by Mr. Sugg, you observe that a Methven's gas-testing apparatus was amongst the articles on view. I cannot, however, but regret that one of my illuminating power standards, as manufactured by the authorized makers, Messrs. A. Wright and Co.—the construction of which I thoroughly approve of, and the accuracy of which I am prepared to certify—was not exhibited instead of an instrument which has not received my approval, and of the accuracy of which I know nothing. The simple construction of the standard made by the firm named above will, I feel certain, commend itself to our gas friends in the North, as it embraces all that is necessary to make the instrument an accurate and unvarying standard.

I am indebted to Mr. Greville Williams, F.R.S.—who has arranged to deliver a lecture in Glasgow next week—for his kindness in undertaking to show the instrument with which, during the last six months, he has made several hundred delicate determinations of the illuminating power of various gases; and those who will have the pleasure of hearing the lecture will have the opportunity of inspecting the apparatus.

JOHN METHVEN.

London Gas-Works, Nine Elms, S.W., Oct. 9, 1880.

Legal Intelligence.

SALFORD HUNDRED QUARTER SESSIONS.—WEDNESDAY, OCT. 6. (Before Mr. W. H. HIGGIN, Q.C., Chairman; Mr. CHRISTIE, and Mr. J. A. RUSSELL, Q.C.)

THE STRETFORD GAS COMPANY AND THEIR ACCOUNTS.

At the April sittings of the Court, an application was made on behalf of Dr. C. A. Burgess and Mr. W. S. Sussex, as representatives of the Stretford Gas Consumers Vigilance Association, praying for the appointment by the Court of an Auditor to examine the accounts of the Stretford Gas Company, with a view to obtain, after the Auditor should have presented his report, an order for a reduction to be made in the price charged by the Company for gas. The Court granted the application, and Mr. W. Aldred, of Manchester, was chosen Auditor, and his appointment was approved by the Company. In due course Mr. Aldred submitted his report; but when the case came on for hearing at the July sittings of the Court (see ante, p. 100), the Chairman stated that he did not consider the report was sufficient. What the Court wanted was, he said, that a competent person should show, from the accounts of the Company, by separate balance-sheets for each year, what ought to be the price charged to the consumers for gas. It being then intimated, on behalf of the Company, that they were desirous of having the matter thoroughly inquired into, and had engaged Mr. Locock Webb, Q.C., to answer Mr. Aldred's statements, it was agreed to adjourn the proceedings till the October sittings. Accordingly, the case came on for hearing this day.

Mr. TAYLOR again appeared for the petitioners; Mr. LOCOCK WEBB, Q.C., and Mr. NASH represented the Company.

The CLERK of the Peace (Mr. HILLON) read the petition, which was dated April 19, 1880, and stated that the Stretford Gas Company was incorporated in 1862, their nominal capital being £100,000. The share capital consisted of ordinary shares of the value of £25,000, which were authorized to receive a maximum dividend of 10 per cent.; new shares of the value of £14,000, authorized to receive a maximum dividend of 7½ per cent.; and 19,999 new "A" shares, entitled to receive a maximum dividend of 7 per cent. per annum. Large profits, the petition stated, had been distributed among the Shareholders of the Company in excess of the authorized dividends, and in violation of the provisions of the Gas-Works Clauses Act. The petitioners had been unable to ascertain the amount distributed previous to 1871, but the total sum distributed between that time and 1878 was £7800. The result was that those using the gas of the Company had been greatly overcharged.

Mr. TAYLOR explained that, in accordance with the prayer of the petition, the Court in April last appointed Mr. W. Aldred, of Manchester, to inquire into the accounts of the Company. That gentleman having prepared a report, it was submitted to the Court on the 7th of July; but as the other side had not had time to investigate it, its presentation was deferred, and Mr. Aldred was instructed in the meantime to prepare a supplementary report, showing what the price of gas ought to have been during the years specified. He proposed that the report of Mr. Aldred should be received. It was an extremely voluminous one, and he thought it might be taken as read.

Mr. LOCOCK WEBB said he had no objection to the report being received, but he strongly objected to some portions of it, because he considered it was far beyond the proper province of the gentleman who was appointed to

that came next was Liverpool, where the gas supplied was equal to 21-candle power; in Manchester the gas was equal to about 20 candles, and in Salford to 19 or 20 candles. The Streetford Company were not obliged to supply anything beyond gas of 15-candle illuminating power, which would cost them probably 2s. 6d. per 1000 feet.

In cross-examination by Mr. TAYLOR, witness said that, deducting all the items to which objection was taken in estimating the cost of the production of gas of the present quality, the price to be charged in order to allow maximum dividends to be paid would be 3s. 2d. per 1000 feet. Mr. LOOCKE WARR said this was the case for the Company, and it only remained for him to submit that the Court had no jurisdiction, under the 35th section of the Gas-Works Clauses Act, to deal with the matter in any way, because it appeared from the evidence that the reserve-fund of the Company, which should have been 10,000, had not been invested. If the Court should be of a contrary opinion, then he should submit that the profits of the undertaking of the Company during the preceding year had not exceeded the prescribed amount.

The CHAIRMAN announced that the Court would postpone judgment until the 27th inst.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

The Chief Gas Examiner for the Metropolis (Dr. Williamson, F.R.S.) has just presented his report on the examinations of the gas supplied by The Gaslight and Coke, Commercial and South Metropolitan Gas Companies, during the quarter ending the 30th of September:—

I. *With respect to Illuminating Power.*—The following is the average for the quarter at each of the stations, in standard sperm candles:—

	Average.
The Gaslight and Coke Company—	
Beckton (common gas)	17.4
Friendly Place	17.2
Milbank Street (cannel gas)	21.2
Ladbroke Grove (common gas)	17.9
Devon's Road	17.3
Carlisle Square	16.8
Camden Street	17.5
Graham Road	17.1
Commercial Gas Company—	
Farnell Road (common gas)	17.3
Wellclose Square	16.9
South Metropolitan Gas Company—	
Hill Street, S.E. (common gas)	16.7

The average for the quarter has at all the stations of the three Gas Companies been above the requirements of the Acts of Parliament.

II. *As regards Purity.*—Sulphuretted hydrogen has not been present in the gas. The proportions of sulphur in other forms than this were as follows:—

Grains of Sulphur per 100 Cubic Feet of Gas.

	Average.
The Gaslight and Coke Company—	
Beckton	10.2
Friendly Place	8.6
Milbank Street	9.9
Ladbroke Grove	11.1
Devon's Road	11.3
Carlisle Square	13.9
Camden Street	11.4
Graham Road	11.3
Commercial Gas Company—	
Farnell Road	9.7
Wellclose Square	7.4
South Metropolitan Gas Company—	
Hill Street, S.E.	10.7

The average for the quarter has been at all the stations considerably below the limits fixed by the Acts of Parliament.

Ammonia has been present in the gas to a slight extent at all the stations, with the exception of Beckton, North Woolwich. The average has been far below the parliamentary maximum.

The testing-station at Graham's Road, Dalston, was closed for repairs from the 24th to the 29th of September.

THE TESTING-PLACES FOR THE CHARTERED COMPANY'S GAS.—The Winter Instructions of the Metropolitan Gas Referees make certain alterations in the places for testing the gas of the Chartered Gas Company. They will in future be 10 in number. The old stations at Beckton and Friendly Place, Mile End, and, as usual, those at (1) Milbank Street, (2) Ladbroke Grove, Notting Hill, (3) Bruce Terrace, Devon's Road, Bromley, (4) Carlisle Square, Chelsea, (5) Camden Street, and (6) Graham Road, Dalston, are retained; while the four new ones are (7) No. 3, Jewry Street, Aldgate, (8) No. 10, King Street, Cloth Fair, (9) No. 1, Dorset Buildings, Salisbury Square, Fleet Street, and (10) No. 47, Kingsland Road.

METROPOLIS WATER SUPPLY.

The following are the returns made by Dr. C. Meymott Tidy, M.B., &c., on the Composition and Quality of the Metropolitan Waters in September, 1880:—

[The results are stated in grains per Imperial gallon of 70,000 grains.]

NAMES OF WATER COMPANIES.	Total Solid Matter.	Oxygen required by Organic Matter, &c.	Nitrogen. As Nitrates, &c.	Ammonia.	Hardness (Clark's Scale).	Before Boiling.	After Boiling.
<i> Thames Water Companies.</i>							
Grand Junction	19.33	0.056	0.126	0.000	14.8	2.8	2.8
West Middlesex	19.02	0.041	0.125	0.000	14.8	2.8	2.8
Grand Junction and Vauxhall	19.03	0.118	0.125	0.002	14.8	2.8	2.8
Chelsea	19.01	0.092	0.125	0.000	14.8	2.8	2.8
Lambeth	19.80	0.048	0.125	0.000	15.0	2.8	2.8
<i> Other Companies.</i>							
Kent	30.56	0.000	0.437	0.000	21.2	5.1	5.1
New River	20.78	0.056	0.135	0.000	15.4	3.0	3.0
East London	18.82	0.023	0.104	0.000	15.0	3.0	3.0

Note.—The amount of oxygen required to oxidize the organic matter, nitrates, &c., is determined by a standard solution of permanganate of potash acting for three hours.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, Southwark and Vauxhall.

COURT OF COMMON COUNCIL.—The following notice of motion has been given by Mr. Pearce Morrison, for consideration at the meeting of the Court of Common Council on the 21st inst.:—"That it be referred to the Gas and Water Committee to consider the advisability of offering a substantial

premium or premiums to Engineers and others for the best plan or mode of supplying the Metropolis with water, having especial regard to sufficiency, quality, and economy; and to report thereon fully to this Court."

HALIFAX CORPORATION GAS SUPPLY.

REDUCTION IN THE PRICE OF GAS.

At the Meeting of the Halifax Town Council on Wednesday last—the Mayor (Alderman Baintown) in the chair, the Gas Committee reported that they had resolved on reducing the price of gas supplied at 4s. 4d. per 1000 feet to consumers within the borough, and from 4s. 3d. to 3s. 5d. per 1000 feet to those outside the borough, with the usual discount in each case, such reduction to take effect from the 1st of January next. It was also resolved that in preparing future estimates of the Committee, a sum of £2500 be provided for as a profit, representing the percentage on the estimated amount of capital account, and if any profit should be made beyond this sum, it should be placed to the credit of an account to be called the "stores account," and when this account reached £7000, all surplus balances should be transferred to the credit of the gas department, and be dealt with in the estimates of the coming year. Alderman RILEY moved the confirmation of the proceedings, and submitted the following figures showing the financial position of the works yearly since 1874. The figures represent the price per 1000 feet of gas sold:—

	1874.	1875.	1876.	1877.	1878.	1879.	Estimate, 1880.	1881.
	d.	d.	d.	d.	d.	d.	d.	d.
Coal and cannel	19.14	19.92	15.36	13.39	12.73	12.19	9.77	9.33
Less residuals	11.14	10.38	8.83	10.72	9.15	10.09	10.00	9.06
Net cost of coal	8.47	8.64	6.53	2.67	2.58	1.51	0.23	0.87
Working expenses—								
Salaries and wages	7.12	6.50	6.23	6.47	6.09	6.10	6.17	5.86
Purifying materials	1.00	0.92	0.73	0.72	0.22	0.30	0.13	0.16
Maintenance, repairs, &c.	4.07	3.97	3.76	3.19	3.07	1.48	2.17	1.98
General workmen, repairs, &c.	3.63	3.80	3.56	3.92	2.18	2.14	1.85	1.96
Miscellaneous expenses	2.47	2.38	2.30	1.89	1.88	1.83	1.74	1.68
Rates and taxes	3.74	3.48	3.75	3.44	3.68	2.96	2.77	2.49
	21.16	21.65	20.43	18.73	17.12	14.83	14.83	14.13
Less meter-rents	2.31	1.86	1.76	1.80	1.81	1.72	1.11	0.99
	18.65	19.79	18.67	16.93	15.31	13.11	13.72	13.14
Cost of gas at consumers meters	27.12	23.43	23.20	19.60	17.89	14.62	13.49	14.01
Profit—								
Interest on capital	10.19	10.92	9.41	9.69	9.71	9.99	9.42	8.94
Sinking-fund	1.38	1.77	1.62	1.64	1.64	1.56	1.43	1.33
Renewal account	1.48	1.59	1.34	3.03	3.03	2.88	2.66	—
Balance absorbed by borough-fund	5.98	4.37	5.46	6.04	4.37	4.40	3.93	2.50
Total profits	19.83	18.85	17.99	21.02	18.95	22.83	23.46	12.47
Price received per 1000 feet of gas sold	46.95	47.28	43.19	40.62	36.84	37.45	36.95	26.48

He added that there was a great increase in the consumption of gas for strictly manufacturing purposes, and he thought it very important that the Corporation should encourage the development of local industries by supplying them with cheap gas and cheap water. It was to be hoped the reduced price would lead to enhanced profit, as had been found to be the case in years gone by. He thought there was nothing to fear now from the electric light, nor did he think any system of lighting could at all compete with that of coal gas supplied at 2s. or 2s. 4d. per 1000 cubic feet. He was bound to say that, in obtaining the results achieved, they had been excellent management, and he could not do less than pay a compliment to the Manager, Mr. Carr, who was a gentleman who had the interests of the Corporation at heart. There was never any improvement introduced in the manufacture of gas but Mr. Carr felt it incumbent upon him to make himself master of the subject, and to use his knowledge for the benefit of the town. It had been mentioned to him (Mr. Riley) that with the gas at 2s. 4d. per 1000 feet Halifax would not be on an equality with Leeds, at 1s. 10d. When they took into account the illuminating power—Halifax was supplying 2 candles better gas than Leeds—and when they took into account the advantages of the gas, and the fact that it was in the matter of interest and rates as compared with Leeds, he maintained they were supplying at a cheaper rate than the Leeds Corporation.

Alderman MIDGLEY most heartily congratulated the Gas Committee on what they had been able to accomplish. He had taken the statistics for a dozen years at least on all the points referred to by Alderman Riley, and he remembered that the lowest price they had ever had coal at was 1s. 5d. per 1000 cubic feet of gas made. They saw that now it was made for less than 10d., which was almost more than could be expected from works of this kind. During all the time he was in the Committee, the interest was about 10s. per 1000 cubic feet of gas made, and he was glad to see that after completing a very large addition to the works, capable of turning out as much gas as all the old works put together, the Council could actually lower the proportion of interest. He was well satisfied that next year there would be a very handsome surplus from the gas-works.

The Mayor said he rejoiced with the Committee and the Gas Committee and Alderman Midgley with joy unexpressed. The action now taken placed the Committee in this position: They were not reducing the price of gas to such a figure as would make the expenditure equal to the income, but they had taken this wise precaution—they were in the habit of borrowing money at 4 per cent., and were charging their customers with 5 per cent. He thought it a perfectly sound principle in a business of any kind, where they could borrow money at 4 per cent., and where the services were given free so far as the Gas Committee were concerned, that some acknowledgment should be shown at the end of the year for services rendered. The Mayor then covered the subject.

Mr. BOOTH asked the Chairman of the Gas Committee to explain the stores account, which was to accumulate until it reached £7000. Alderman RILEY said there were about £7000 worth of stores in connection with the works, and the Committee had no power to borrow money against the surplus profit over and above the £2500 would be paid into the bank to the credit of this stores account until the sum amounted to £7000, as working capital.

The recommendations were then agreed to.

TRANSFER OF THE STROOD WATER-WORKS TO THE ROCHESTER CORPORATION.—At a special meeting of the Rochester Corporation on the 28th ult., the sum settled at which the transfer to the Corporation of the property of the Strood Water-Works Company—viz., £6700, with £445 for the removal of machinery and costs of the transfer—was to take place, was on the motion of Alderman BELL, seconded by Mr. Belsey, ordered to be paid by the City Treasurer. This having been done, the transfer was completed.

LONDON GASLIGHT COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Wednesday, at the Freemasons Tavern, Great Queen Street, London—the GOVERNOR Mr. Rohde Hawkins, Esq. in the chair.

The SECRETARY (Mr. A. J. Dove) having read the notice convening the meeting, the corporate seal of the Company was affixed to the register of Proprietors, and the following report and accounts were presented:—

The accounts annexed to this report show the result of the manufacture and distribution of the Company's gas for the half year ending June 30, 1880. A comparison of these accounts with those for the corresponding period of 1879

exhibits an increase in the rental for gas of £3829 15s. 6d.; but, on the other hand, there is a falling-off in the receipts for coke and breeze amounting to £163 19s. 3d.

The profit and loss account, after providing for interest and dividend on preference capital, shows a balance of £20,317 11s. 3d., out of which the Directors recommend that a dividend at the rate of 10 per cent. per annum be declared on the ordinary capital of the Company, such interest and dividends to be paid on Oct. 15, 1880.

The plant in works and mains has been well maintained, and ample provision made to meet the requirements of the public.

The Bill in Parliament, promoted by the Company for the purpose of increasing the consumption of gas by letting on hire stores and engines for motive power, and referred to in the last report, received the Royal Assent on Aug. 3, 1880.

No. 1.—STATEMENT OF STOCK AND SHARE CAPITAL, on June 30, 1880.

Acts of Parliament relating to the Raising of Capital.	Description of Capital.	Maximum Authorized.	Number of Shares Issued.	Nominal Amount of Shares.	Called up per Share.	Total paid up.	Arrears of Calls.	Remaining to be called up.	Total Amount Authorized.
15 Vict., cap. 82	Ordinary stock 2nd pref. " 3rd ditto " 1st ditto " 4th ditto shares	10 per cent. 6 ditto. 6 ditto. 6 ditto. 6 ditto.	Stock Do. Do. Do. Do.	Stock Do. Do. Do. Do.	Stock Do. Do. Do. Do.	£390,000 5,650 1,500 150,000 188,307	.. .. .. .	.. .. .. .	£390,000 5,650 1,500 150,000 300,000
29 Vict., cap. 55.			Stock	£25 0 0	£30 and £1 5s.	26,613	..	£111,693	26,613
20 & 21 Vict., cap. 73.	1 & 2 Deb. stks. 6 & 5 ditto.		Stock				..		

* With option of conversion.

No. 2.—STATEMENT OF LOAN CAPITAL.

Acts of Parliament authorizing the Loan Capital.	Description of Loan.	RATES PER CENT. OF INTEREST.	Total Amount Borrowed.	Remaining to be Borrowed.	Total Amount Authorized.
		4½ per Cent. 5 per Cent.			
15 Vict., cap. 82	Bonds, 4½ per cent.		£7,687		£91,667
29 Vict., cap. 55	Debenture stock, &c.		£97,349	£81,305	100,000

No. 3.—CAPITAL ACCOUNT.

Dr.	Description of Capital.	Certified Receipts to Dec. 31, 1879.	Received since that date.	Total Receipts to June 30, 1880.
To Expenditure to Dec. 31, 1879	By Ordinary stock	£381,535 3 10	£200*	£390,000 0 0
Balance	2nd Preference ditto.	10,563 5 0		5,650 0 0
	3rd ditto ditto.			1,500 0 0
Total expenditure.	1st ditto ditto.	£812,098 8 10		150,000 0 0
Balance	A ditto shares, £25 each, including amount received in anticipation of calls	17,521 6 2	187,047 10 0	188,307 0 0
	1st & 2nd Debenture stocks, under 20 & 21 Vict., cap. 73		26,613 5 0	26,613 5 0
	Bonds, &c.		68,987 0 0	68,987 0 0
	4½ per cent. debenture stock		30,562 0 0	30,562 0 0
		£389,619 15 0	£80,639 15 0	£500,619 15 0

Note.—* £200 converted into ordinary stock. † £2000 paid off.

No. 4.—REVENUE ACCOUNT, for the Half Year ended June 30, 1880.

To Manufacture of gas—	By Sale of gas—
Coke, including dues, carriage, unloading, and trimming (see statement No. 3)	Common gas, per meter, at 3s. 3d. per 1000 cubic feet
Salaries of Engineers, Superintendents, and other Officers at works	Public lighting, and under contracts—
Wages (carbonizing)	Common gas
Purification, including £1150 0s. 7d. for labour	(See statement No. 10.)
Repairs and maintenance of works and plant, materials, and labour, less £297 14s. 7d. for old materials	Rental of meters
	Residual products—
Distribution of gas—	Coke, less £2264 1s. for labour and cartage
Salaries and wages of Officers (including Rental Clerks)	Breeze, less £216 12s. 11d.
Repairs, maintenance, and renewals of mains and service-pipes, including labour	Tar, less £18 18s.
Repairs and renewals of meters	Ammoniacal liquor, less £24 1s. do.
Lighting and repairing	Rents receivable
Rents, rates, and taxes—	Transfer fees
Rents payable	
Rates and taxes	
Management—	
Directors' allowance	
Company's Auditors	
Salaries of Secretary, Accountant, and Clerks	
Collectors commission	
Stationery and printing	
General charges	
Law charges	
Bad debts	
Depreciation-fund for works on leasehold land	
Superannuations, sick allowances, and gratuities	
Total expenditure	
Balance carried to net revenue account, No. 5	

No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on bonds, 4½ per cent. debenture stock, &c., to June 30, 1880.	Balance from last account
Dividends on preference capital	Less dividend on ordinary capital for the half year ending Dec. 31, 1879
Interest on temporary loans	Amount carried to reserve-fund to Dec. 31, 1879
Redemption-fund, reserve per London Gaslight Act, 1857	Amount from revenue account, No. 4
Balance applicable to dividend on ordinary capital	

No. 6.—RESERVE-FUND.

Balance on June 30, 1880	Balance on Dec. 31, 1879
Interest on amount invested	Amount brought from net revenue for the year 1879

No. 7.—DEPRECIATION-FUND (FOR WORKS ON LEASEHOLD LAND).

Balance on June 30, 1880	Balance on Dec. 31, 1879
Interest on amount invested	Amount brought from revenue account for the half year ending June 30, 1880

No. 8.—STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1879.	Received during the Half Year.	Carbonized during the Half Year.	Used for Sandries during the Half Year.	In Store, June 30, 1880.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	7,341	83,735	74,389	24	16,663
Cannel	1,172	4,313	4,047	..	1,438

No. 9.—STATEMENT OF RESIDUAL PRODUCTS.

Description of Residual.	In Store, Dec. 31, 1879.	Made during the Half Year (estimated).	Used during the Half Year (estimated).	Sold during the Half Year.	In Store, June 30, 1880.
Coke, chaldrons of 36 bush	4,138	76,310	19,613	60,465	480
Breeze	680	10,655	..	10,577	167
Tar, gallons	157,000	828,822	..	869,822	116,000
Am. liq., butts of 108 gals.	1,963	18,738	..	20,308	333

No. 10.—STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity made (measured by Station Meters).	QUANTITY SOLD.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
Common.	Thousands. 782,481	Thousands. 51,552	Thousands. 689,319	Thousands. 731,571	Thousands. 9,006	Thousands. 740,577	Thousands. 11,661	5,562

BALANCE-SHEET.

To Capital—	By Cash at Bankers and in hand	£13,514 14 11
For balance, per account No. 3	Amount invested—	
Net revenue—	Reserve-fund	£69,260 11 4
For balance, per account No. 5	Redemption-fund	7,390 0 6
Reserve-fund—	Unclaimed dividends	4,871 2 7
For balance, per account No. 6	Depreciation-fund (for works on leasehold land)	2,945 4 0
Depreciation-fund (for works on leasehold land)—		
For balance, per account No. 7	Stores on hand, viz.—	83,586 15 5
Redemption-fund	Coals	£13,476 19 4
Bond, 10 per cent. debenture stock, &c., interest for amount due to June 30, 1880	Gaslight and broom	1,105 0 0
Preference dividends, ditto	Tar and ammoniacal liquor	1,329 3 4
Unclaimed dividends	Sundry stores	4,289 17 9
Sundry tradesmen and others, for amount due for coals, stores, and sundries	Accounts due to the Company—	19,261 0 5
	Gas and meter rental, quarter ending June 30, 1880	£35,615 18 3
	Ditto arrears outstanding	6,386 5 1
	For coals and other residual products	£3,002 3 4
	Sundries	145 2 2
		875 7 8
		53,900 9 2
		£172,543 2 11

The GOVERNOR said: Before moving that the report be received and adopted, I should like to say a few words. You have this report before you, and our friend the Editor of the JOURNAL OF GAS LIGHTING says it has a "fine old flavour" about it. Well, I am glad it has this fine old flavour, because this flavour is one of continuing success. For some years past we have been fortunate enough to earn sufficient money to pay our full dividends, and I am thankful to say also from year to year to lay by a very substantial little sum towards our reserve-fund, so as to give additional security against any evil time that may fall upon us. And not only is the favour of the report satisfactory to us, but our Shareholders are pleased, and I think it must also be satisfactory to the public. Not many years ago the price we charged for our gas was 4s. 6d. per 1000 cubic feet; then it came down to 4s. 3s. 9d., 3s. 6d., and it is now 3s. 3d.; and I am happy to be able to announce that the Directors think they will be fully justified in reducing the price to 3s. from the 1st of January next. I consider, therefore, that the flavour is good all round. I am aware that some of the Shareholders are of opinion that it would be an advantage if they could participate in the sliding scale, and obtain a little more dividend in this way; but I think that there is a great deal to be said on both sides. We are aware that you might receive a little more dividend; but a higher dividend means sometimes rather a lower security; and I think the Shareholders should consider this question very materially before they press for any great alteration in our present system. If you accepted the sliding scale, you must remember that in hard times, when prices of coal are high, and you cannot get very good prices for some of your products, your dividends are liable to material reduction; and as I said before, security is of more importance than a high rate of interest. Now, without in the slightest degree cavilling, or finding fault, or depreciating the security offered by those Companies which are under the sliding scale, I think that you do not quite understand how very much better is the security of a Company like ours, living and working under the Acts of Parliament by which we work. If you, now, you take the sliding scale Companies—take The Gaslight and Coke Company—they are selling their gas, I believe, at 3s. 4d. per 1000 cubic feet. Their maximum price is 3s. 6d., and that is to say, they have a margin of safety of 6d. or 6d.—I do not quite know what is their price. If you take the large amalgamated Company on the south of the Thames, you find them selling their gas at 3s., and they have a maximum price of 3s. 6d. There, again, is their margin of safety. If they charge beyond this, they must pay a dividend below 10 per cent. If you take our Company from the 1st of January next, we shall sell our gas at 3s.; but our maximum price is 4s. 6d. Our Act enables us to go to 4s. 6d., in order to cover any deficiency that may occur. Therefore our margin of safety is 1s. 6d. More than this, we are selling 16-candle gas, while our Act only requires us to sell 12-candle. This is a candle to the good, and that is another 6d. of margin; so that of our own will we have a margin of 2s. against a margin of 6d. in the case of the Companies working under the sliding scale. But we have even a further protection, because, if, under any peculiar circumstances—I do not suppose they will occur, but if they do take place, and we find ourselves not paying the dividend of 10 per cent. on our ordinary stock, even charging 4s. 6d. per 1000 feet, our Act empowers us to go to the Secretary of State for the Home Department, and ask him to give us a still higher price; and however much he might dislike to do so, he could make a real, honest, clear statement, I believe it would be bound to do so. I think it is quite reasonable to say that 10 per cent. with such a large margin of security is better than 11 per cent., or even 11½ per cent., with a much smaller margin. A subject I wish also to draw the attention of every Shareholder to is the electric light. You know that from time to time we have "scars" about the electric light. Now, we only meet every six months, and the Directors cannot call you together if there happens to be a fresh scar; therefore, all I say is, do not pay the slightest attention to it. The most scientific people will tell you that there is business, both at the present time and in the future, for gas manufacturers—or, rather, for us as distributors of coal—which is quite irrespective of lighting by electricity. I believe myself most firmly that if the electric light were brought forward and made of more use for lighting large spaces and buildings, there would still be business for us, independently of the loss which might thus be occasioned to us, and that the business would enable us to pay our dividends with the greatest possible ease. The fact is that the use of gas as an illuminating agent might entirely cease, but it would remain as a heating agent. You must have motive power for engines, and we see to-day that gas is becoming more popular for driving engines, and for warming, and for other purposes of this sort; and if you take this into consideration, with the fact that the residual product—tar, ammoniacal liquor, and such things—are rising in value year by year, I hope you will not be frightened at anything you hear about the electric light. Bear in mind that you have a most valuable property, and if any injury is done to it, it will be through your being afraid. I hope you will understand that the Directors are not sitting down, and letting these things happen without taking notice of them, but that they are considering your

business in all its bearings, and striving, to the utmost of their power, to carry on that business to the best advantage. I now move—"That the report of the Directors and the accounts now laid before the meeting be received and adopted."

Mr. HOBSON, in seconding the motion, said that as a Director of the Sheffield United Gas Company for 22 years, he could state that it was also an old-fashioned Company paying 10 per cent., but their policy had been different from what the Governor said might be the London Company's, with their wide margin, and selling gas at 3s. per 1000 cubic feet. The Company had theoretical—in fact, legal, paid up—£250,000, and to apply for a higher maximum if that was not sufficient to pay their 10 per cent. At Sheffield they had to go through the coal famine of 1873-74 something like the London Companies had; but if there ever was a blunder made by a part of members of some London Gas Companies, it was in rushing up to 5s. charge. The Sheffield Company's price went at that time 3s. 1d. per 1000, and, as one of the Directors of the Company, he signed a contract for coal at an increased price. It cost them £10,000 more than the previous contract, but they did not raise the price of gas. It remained at 3s. 1d., and when they were able, when coal was cheaper, the Directors were perfectly aware of this, and, therefore, went down to 2s. for the public lights; and their reserve-fund was quite full—10 per cent. Their policy, therefore, was the reverse of what the Governor had foreshadowed in the event of certain contingencies. The Company, however, could not go to 4s. 6d. without raising a perfect storm of dissatisfaction. The Gaslight and Coke Company created it by rushing up to 5s., and the worthy Governor must be aware that it would be very unsatisfactory to raise the London Company's price from 3s. to 4s. 6d. He did not, indeed, believe that the Board would consent to it. As to the illuminating power of the gas, the days were gone by when the public would be satisfied with 12 candles per 1000. This Company, like Sheffield Company, were working under the old Acts; but the latter, seeing that they would never get such powers again, had done what he had recommended this Company to do—converted their debenture stock into share capital, paying 10 per cent. He saw that the Company had some 4 per cent. bonds under their old Acts, and they had the power to pay them off with share capital, which could be created for this specific purpose. He was aware that if they did so they could not borrow any more money at 4 per cent., but must call on the Shareholders for fresh capital. They might say their margin of profit was not enough to enable them to turn 4½ per cent. into 10 per cent., but with the present low price of coal there was margin enough in a gas company to do pretty well what they pleased; and if it required to take £8000 or £4000 from the reserve-fund they could do so, as the Sheffield Company did. The stock could be created to pay 10 per cent., and thus they could give the Shareholders 80 or 90 per cent. bonus—the difference between par and 10 per cent. They might say that this privilege would be theirs could. The time would come when they would probably have to ally themselves with The Gaslight and Coke Company or the South Metropolitan Company. He had between £20,000 and £30,000 in those two Companies jointly, and he was quite satisfied with his investment, deprecating 15 per cent. on the old, and 11 per cent. on the "B" stock of the South Metropolitan Company, and 11 per cent. on the stock of The Gaslight and Coke Company. He knew the margin was not so great between 3s. and 4s. 6d. and 3s. and 3s. 9d.; but coal must go to a panic price before they could think of charging 4s. 6d. He knew he was speaking of the future. He did not know that he did not feel quite as well off in the Sheffield Company, with his 10 per cent., as with his investment in the London Companies. He again urged the Board to issue ordinary stock for the debentures.

MR. JONATHAN DENNY thought that had the Governor stated that an amalgamation with the *tears*, they would have received the announcement with great delight, and in this case they would have to come under the sliding scale, of which the Governor seemed so much afraid. The Company was in such a flourishing state that he (Mr. Denny) was sorry they had not seen their way to take what he called the "B" stock. In fact, he did not know that they had thought it well to sell gas at an average of 2s. 3d. per 1000 feet; but the full 10 per cent. dividend and the full reserve-fund had been maintained, besides carrying forward a balance. He confessed that he was not fully in love with the new system, and he quite agreed with the Governor as to the advantages of the old system. He quite agreed with the Governor as to the advantages of the old system. He quite agreed with the Governor as to the advantages of the old system.

The motion—that the report be received and adopted—was then put and carried unanimously.

The GOVERNOR (Mr. Hobson): I ought to have told you that as to the question of raising the price to 4s. 6d. per 1000 being an absolute proceed-

MANCHESTER CORPORATION GAS SUPPLY.

REPORT OF THE GAS COMMITTEE FOR THE YEAR ENDING JUNE 24, 1880.
The operations of the Gas Committee during the past year, in common with those of other commercial undertakings, have been seriously influenced by the unfortunate depression which has existed in almost every branch of trade, and notably in the staple industries of Manchester. This is forcibly illustrated by the fact that the number of gas consumers in the Committee's district, as compared with last year, shows a decrease of 1029, or 1.41 per cent.

It is, however, satisfactory to note that while, on the one hand, the consumption of gas exhibits an increase of 0.98 per cent. only, as against last year's increase of 8.02 per cent., and the coke sales for the year have extended to the extent of £1790, the Committee have been enabled, on the other hand, by taking advantage of the favourable state of the coal and canal market, to reduce the expenditure under this head by £13,000. In addition to this the new contract for the purchase of the ammoniacal liquor, although it has only been in force during the latter half of the year, has brought in £7700 more than was utilized by the same residual product in the corresponding period of the previous year.

Notwithstanding the increased difficulties of collection, the amount posted to the bad debts account is 34 per cent. less than that for the previous year; the total loss being only 0.2 per cent.

The continued heavy expenditure under capital account in connection with the new works has necessitated a large increase in the amount to be provided for interest. The total expenditure on account of street lighting is £23,386, or nearly £14,000 in excess of the amount expended during the portion of the previous year subsequent to the introduction of the new arrangement.

The Committee, however, are pleased to report that the net result of the year's working enables them to place at the disposal of the Improvement Committee the sum of £52,000, but, in accomplishing this, assistance is needed from the reserve-fund to the extent of £1612 15s. 2d.

The important question of economy of labour is continuing to receive the earnest attention of the Committee, and it is believed that extensive retrenchment will be brought about in the expenditure under this head. The loss of gas by leakage is likewise being dealt with.

The Committee have carefully considered the question of a reduction in the price of gas, and they have unanimously resolved to recommend the Council to authorize a reduction of 2d. per 1000 feet within the city, and 2d. per 1000 feet beyond the city boundaries, and also a reduction of 2s. per lamp per annum in the price charged for public lights outside the city, to take effect from Dec. 25, 1880.

The reports of the Analytical Chemist and the Auditors are submitted, and the usual statistical statements are appended, viz.:—Appendix A, statement of lamp and private rentals; Appendix B, statement of gas transmitted from the works; Appendix C, table showing the number of meters in use; Appendix D, table showing gas-mains laid and taken up during the year; Appendix E, statement showing the amount of gross profit and the mode of its appropriation, &c., since 1862.

(Signed) JOSEPH LAMB, Chairman.

Gas Office, Town Hall, Sept. 30, 1880.

"To the Chairman of the Gas Committee.

"Sir,—I have the honour to report to you that the average illuminating power of the Manchester gas during the past year has been equal to that of 21.92 London standard candles.

The gas has been tested photometrically at the Gaythorn and at the Rochdale Road stations almost daily. The standard of comparison adopted has been the light of a London standard sperm candle burning at the rate of 120 grains per hour. The average of the highest readings of the photometer has been equal to 22.37 candles, and of the lowest 19.92 candles.

"The gas has been tested daily for sulphuretted hydrogen and for ammonia. It has been allowed to flow continuously through test solutions, and the amount of impurity in large volumes of gas has been determined when of sufficient quantity to allow of weighing. As the gas has passed through these solutions during the night as well as the day, and during Sundays as well as on other days, any negligence in the purification at these times would have been detected.

"The gas may be said to have been quite free from ammonia. On no occasion, at either station, has the evaporation of an acid solution through which upwards of 300 cubic feet of gas have passed, left more than a slight film of acid of ammonia on the surface of the evaporating vessel.

"The gas at Gaythorn station has also, with a few exceptional times of slight duration, been quite free from sulphuretted hydrogen.

"At Rochdale Road station the gas has more frequently shown the presence of sulphuretted hydrogen. The quantity in 100 cubic feet has rarely, however, been more than sufficient to produce a discoloration of the test solution.

"The carbonic acid in the gas has varied from 1½ to 3 per cent. of the volume of the gas.

"Bisulphide of carbon vapour has been present in the gas in varying quantity. The range may be expressed by equivalents in sulphur of from 25 grains to 45 grains in 100 feet of gas.

(Signed) "JOHN LEIGH, M.R.C.S.L., Medical Officer of Health."

[The report of the Auditors was also appended.]

STATEMENT OF ASSETS AND LIABILITIES.

PERMANENT ASSETS.

Gaythorn station—	
Land, buildings, and apparatus, as per last report—	
Land	£50,467 16 10
Buildings	60,821 19 10
Apparatus	56,158 8 3
Less depreciation	£177,431 4 11
	5,240 15 3
	£172,219 6 6
One year's outlay to June 24, 1880—	
Buildings	£3,143 4 9
Apparatus	2,291 12 2
	5,434 16 11
	£177,653 3 3
Rochdale Road station—	
Land, buildings, and apparatus, as per last report—	
Land	£31,865 4 10
Buildings	110,536 3 6
Apparatus	30,383 19 9
Less depreciation	£222,725 4 1
	8,410 12 8
	£214,284 11 5
One year's outlay to June 24, 1880—	
Buildings	£5,516 13 1
Apparatus	9,905 17 0
	15,332 10 1
	£229,637 1 6
Carried forward	£,607,282 4 11

Brought forward £,607,282 4 11

Droyden station—	
Land, buildings, and apparatus, as per last report—	
Land	£288 17 3
Buildings	5,315 10 5
Apparatus	5,309 7 0
Less depreciation	£11,455 3 8
	478 2 11
	10,977 0 9

Bradford Road station—	
Land, as per last report	£116,315 16 5
Buildings, ditto	56,563 7 2
Apparatus, ditto	162,632 18 2
Less materials sold	£275,532 1 9
	43 11 6
	£275,488 10 3

One year's outlay to June 24, 1880—	
Land	£169 3 0
Buildings	7,506 3 0
Apparatus	69,471 9 1
	68,116 15 1
	345,655 5 4

Street-mains stores (Poland Street)—	
Land, as per last report	£1,406 0 0
Buildings, ditto	1,363 19 9
Apparatus, ditto	325 4 10
Less depreciation	£3,295 4 7
	78 16 5
	3,216 8 2

Street-mains—	
Main-pipes, as per last report	£254,004 10 1
Less depreciation	6,350 2 3
	£247,654 7 10
One year's outlay to June 21, 1880	
	13,662 17 5
	260,707 5 3

Service-pipes—	
Service-pipes, laid as per last report	£28,941 16 6
Moisty of one year's outlay, charged to capital account	1,608 0 4
	30,549 16 10

Hired meters—	
Outlay, in last report	£61,763 14 7
Less depreciation	6,176 7 5
	£55,587 7 2
One year's outlay to June 21, 1880	
	9,609 9 2
	65,217 16 4

Meter-proving apparatus—	
Outlay, as per last report	£67 10 11
Less depreciation	6 15 1
	60 15 10

Lamp department—	
Outlay, as per last report	£363 3 9
Ditto, June 24, 1880	963 15 6
	1326 19 3

FLOATING ASSETS.

Canal, receipts, and other materials on hand	£33,670 13 0
Gas-rents and sundry accounts due to the Committee—	
Revenue account	63,630 9 3
Balances in hand, June 24, 1880	77,667 7 1
Ditto in Treasurer's hands, June 24, 1880	2,836 5 5
	197,794 16 9
	£1,320,798 11 5

EXCESS OF ASSETS, June 24, 1880	£568,082 0 11
Ditto of assets, June 24, 1879	539,735 6 10
Increase, being the amount charged upon profit and loss for the present year towards liquidation of the mortgage debt, and carried to capital account	
	£29,216 11 1

LIABILITIES.

Mortgage debt	£538,512 6 10
Purchase of land, the purchase-money being left in the hands of the Committee at interest	1,750 0 0
Sundry accounts owing—	
Revenue account	12,617 11 1
Extension ditto	106,103 16 6
Deposits in hand	21,010 1 1
Interest on ditto	1,010 2 8
Reserve-fund	18,775 10 4
Amount payable to the Improvement Committee for the year ending June 24, 1880	52,000 0 0
Balance, being excess of assets	568,982 0 11
	£1,320,798 11 5

PROFIT AND LOSS ACCOUNT.

EXPENDITURE.

To Canal	£157,454 10 6
Retort men's wages	29,234 4 9
Retorts, materials, and setting	5,680 7 6
Labourers wages and repairs of works—	
Gaythorn station	£7,800 7 2
Rochdale Road station	9,012 12 10
Droyden	133 11 6
Street-mains	6,283 6 11
Repairs of hired meters	758 13 9
Purifying charges	24,637 11 10
Salaries	5,190 12 8
Chief and other rents, rates, and taxes	7,248 7 0
Income-tax	9,017 17 9
Amount transferred to capital account for depreciation of works	26,771 15 2
Stationery and advertising	1,011 17 4
Law expenses, receipt, postage, and deed stamps	409 6 11
Miscellaneous expenses	993 15 7
Clothing for inspectors	386 16 6
Subscriptions	57 10 0
Bad debts	805 6 2
Rent of offices	1,800 0 0
Balance	11,013 1 11
	£395,041 7 6
Interest on loans	£23,629 10 8
Do. on deposits repaid	233 13 8
Do. do. in hand	1,046 2 8
Amount transferred to capital account (sinking-fund set aside)	29,216 14 1
Expenditure on street lighting	£23,366 8 6
Less gas not charged	16,917 6 8
	6,449 10 0
Amount payable to Improvement Committee	52,000 0 0
	£112,625 3 1

PROFIT AND LOSS ACCOUNT—(continued).

INCOME.			
By Gas-rental—			
Within the city—			
Private consumers	£218,083	12	3
Meter-rents	4,493	10	7
Gas consumed in public lamps	—	—	—
not charged .£91,617	6	8	—
	£222,327	2	10
Beyond the city—			
Private consumers	£81,150	10	2
Meter-rents	1,595	3	1
Public lamps	7,250	8	2
	90,465	1	5
	£332,732	4	3
Coke	20,535	15	3
Tar	34,964	2	4
Ammonia water	26,615	11	1
Rents	193	14	7
	£385,041	7	6
Balance brought down	£103,013	1	11
Transfer from reserve-fund.	1,612	1	2
	£112,625	8	1
GENERAL SUMMARY OF RECEIPTS AND EXPENDITURE ON CAPITAL AND REVENUE ACCOUNT.			
RECEIPTS.			
To Balance in bank, June 24, 1879	£100,798	9	2
Ditto in Treasurer's hands, June 24, 1879	166	13	5
Ditto on sums owing to and by the Committee, including stocks on hand, June 24, 1879	27,889	10	0
Carried forward	£128,853	13	7

	Brought forward	\$128,853 10
Balance of profit and loss account, as per statement—		\$2,000 00
Loans received		10 11 6
Materials sold (capital account), as per statement—		
Bradford Road station		43 11 6
Amount transferred from revenue account—		
For depreciation of works		26,771 15
Liquidation of mortgage debt		29,246 14 1
Balance of sums owing to and by the Committee, including stocks on hand, June 24, 1880		23,477 9 1
		<u>\$260,403 14 4</u>
EXPENDITURE.		
By Loans repaid		\$12,078 12 2
Improvement Committee—		
Surplus for the year ending June 24, 1879		\$2,000 00
Expenditure on capital account		
Gaythorn station	\$5,434 16 11	
Rochdale Road station	15,028 10 1	
Bradford Road station	63,146 13 1	
Street-mains	13,052 17 5	
Service-pipes (one moiety)	1,063 0 0	
Hired meters	9,660 9 2	
Lamps	963 15 6	
		<u>114,219 4 6</u>
Balance in bank, June 24, 1880	\$77,637 7 1	
Ditto in Treasurer's hands, June 24, 1880	2,856 9 5	
		<u>\$80,493 16 6</u>
Amount transferred from reserve-fund		1,612 1 2
		<u>\$79,043 14 4</u>

GEORGE B. JACKSON, Superintendent.

[APPENDIX A.]

Statement of the Lamp and Private Rental (including Meter-Rents) derived from Townships within and beyond the City respectively, for the Years 1878-79 and 1879-80

	Half Year ending Dec. 25, 1878.			Half Year ending June 24, 1879.			Total for Year 1878-9.	Half Year ending Dec. 25, 1879.			Half Year ending June 24, 1880.			Total for Year 1879-80
	£	s.	d.	£	s.	d.	£ s. d.	£	s.	d.	£	s.	d.	£ s. d.
Within the city—														
Township of Manchester—														
Private rental	63227	17	4	71841	13	1	63733 15 9	63733	15	9	71650	8	8	63733 15 9
Public lamps	4297	6	6	3398	5	8	5415 2 10	5415	2	10	4745	11	8	5415 2 10
Other townships—														
Private rental	47178	12	4	47049	14	2	41240 8 3	41240	8	3	45697	10	2	41240 8 3
Public lamps	3486	2	3	3326	3	6	3556 5 3	3556	5	3	3589	4	9	3556 5 3
Total within the city	112729	18	5	128615	16	5	113650 12 4	113650	12	4	125632	15	0	113650 12 4
Beyond the city—														
Private rental	37812	1	6	43485	12	7	38393 12 10	38393	12	10	44561	0	5	38393 12 10
Public lamps	3384	8	11	3195	10	6	3544 9 7	3544	9	7	3617	0	9	3544 9 7
Total beyond the city	41196	10	5	46679	3	1	42158 2 5	42158	2	5	48178	1	2	42158 2 5
Total	153926	8	10	172794	19	6	155788 14 9	155788	14	9	173800	16	2	155788 14 9
Deduct lamp portion of year not charged							7382 9 8							7382 9 8
Gross rental							219358 18 8							219358 18 8

Within the city: Gross rental (1878-79) £231,163 5s. 2d.; ditto (1879-80) £222,416 0s. 8d.; decrease, £8747 4s. 6d. Beyond the city: Gross rental (1878-79) £88,175 13s. 6d.; ditto (1879-80) £90,316 3s. 7d.; increase, £2140 10s. 1d. Total: Gross rental (1878-79) £319,338 18s. 8d.; ditto (1879-80) £312,732 4s. 3d.; decrease, £6606 14s. 5d.

[APPENDIX B.]

Comparative Statement of the Gas transmitted from the Works, in the Daytime and during the Twenty-four Hours, for the Years 1878-79 and 1879-80.

	DAYTIME.				TWENTY-FOUR HOURS.			
	1878-79.	1879-80.	Increase.	Decrease.	1878-79.	1879-80.	Increase.	Decrease.
	Cubic Feet.	Cubic Feet.	Per cent.	Per cent.	Cubic Feet.	Cubic Feet.	Per cent.	Per cent.
July	27,103,000	32,506,000	19·93	....	102,600,000	113,985,000	11·1	....
August	26,718,000	26,311,000	....	1·52	115,779,000	115,823,000	0·04	....
September	27,444,000	28,975,000	....	....	112,431,000	120,008,000	6·65	2·45
October	37,080,000	48,622,000	31·09	....	209,901,000	229,530,000	9·35	....
November	38,964,000	51,387,000	....	12·85	274,759,000	264,668,000	....	3·67
December	82,065,000	76,312,000	....	7·01	328,325,000	326,395,000	....	27
January	72,070,000	74,361,000	....	3·18	328,097,000	328,097,000	0·73	....
February	60,579,000	49,970,000	....	17·51	262,150,000	257,143,000	....	1·91
March	45,608,000	41,617,000	....	14·37	215,687,000	200,916,000	....	6·85
April	38,080,000	44,597,000	....	9·18	150,870,000	155,548,000	....	1·9
May	32,828,000	27,799,000	....	15·32	129,471,000	119,578,000	....	2·37
June	20,540,000	22,891,000	11·44	....	73,300,000	78,901,000	7·64	....
Total	532,105,000	516,238,000	....	2·98	2,314,970,000	2,333,761,000	0·33	....

During the daytime (1878-79), 532,105,000 cubic feet; (1879-80) 516,238,000 cubic feet; decrease, 15,867,000 cubic feet. During the twenty-four hours (1878-79), 2,314,970,000 cubic feet; (1879-80) 2,323,761,000 cubic feet; increase, 8,791,000 cubic feet.

APPENDIX C.

Table showing the Number of each Size of Meters in Use on June 24, 1879 and 1880, respectively

Size of Meters.		Townships within the City.														Townships beyond the City.		Total.		Increase.	Decrease.
		Manchester.		Chorlton-on-Medlock.		Hulme.		Ardwick.		Bacwick.		Cheetham.		Total within the City.		1879.	1880.	1879.	1880.		
		1879.	1880.	1879.	1880.	1879.	1880.	1879.	1880.	1879.	1880.	1879.	1880.	1879.	1880.						
1 light		14	10	1	..	7	2	1	2	..	..	23	14	0	8	33	22	..	11
2 lights		9995	9265	3352	3156	6057	5710	2441	2366	585	578	12350	11430	23660	22220	9810	9331	33740	31551		
3		4266	4277	2939	2968	2623	2596	847	840	167	185	1015	12543	12381	6822	7169	19165	19550			
4		2712	2710	2202	1975	884	881	128	107	60	68	117	1229	1240	7382	542	457	11751	11649		
5		1778	1815	655	722	290	307	138	172	22	23	335	363	3298	3402	1544	1774	8752	9176		
10		2	..	..	..	..	..	..	..	..	..	3	2	..	..	..	..	..	..
15		1062	1068	184	193	111	121	61	62	4	..	1491	1522	458	501	1925	2027	70	..		
20		485	490	47	50	40	38	19	21	6	6	37	37	634	642	174	178	368	816		
30		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
40		92	20	1	..	2	2	1	1	..	..	..	..	37	38	8	11	48	44
45		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
50		361	374	25	28	28	28	21	22	2	2	34	25	461	479	113	125	574	604		
60		140	144	13	15	16	15	2	2	..	..	9	11	186	187	25	32	205	219
80		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14
100		118	119	9	11	7	7	3	3	2	2	8	8	231	241	44	41	275	282		
150		194	204	13	11	6	6	8	10	2	2	8	8	231	241	44	41	275	282		
200		58	54	7	7	6	5	6	6	..	..	2	2	79	74	20	19	99	93
250		25	28	4	4	3	6	..	1	3	3	3	3	37	42	16	21	51	58		
300		..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..
400		13	16	1	1	3	2	..	..	..	..	3	3	20	22	21	26	41	42
500		..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	..	..
600		3	..	..	..	..	..	..	..	..	..	..	..	..	3	3	3	3	..
800		1	1	..	..	..	..	..	..	..	..	..	..	..	1	1	2	2	..
1000		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total		21562	26237	9233	9140	10103	9720	3999	3918	851	871	4401	4421	49849	49706	23633	24012	73482	72718		
Total decrease, 1939. Deduct increase, 1175, and balance 264 meters.																					

[APPENDIX C—continued.]

Statement showing the Number and Size of Meters on Hire on June 24, 1880 (included in preceding Table).

	1 Light.	2 Lights.	3 Lights.	5 Lights.	10 Lights.	20 Lights.	30 Lights.	50 Lights.	60 Lights.	80 Lights.	100 Lights.	Total, 1880.	Total, 1879.	Increase, 1880.
Within the city	13	15487	9089	4499	1469	384	120	74	31	16	28	31210	30220	990
Beyond the city	5	4856	5646	3342	792	94	18	12	7	1	10	14763	13730	1047
Total	18	20343	14735	7841	2261	478	138	86	38	17	38	45993	43956	2037

[APPENDIX D.]

Gas-Mains Laid and Taken up during the Year ending June 24, 1880.

Laid.	Diam. 2 in.	Diam. 3 in.	Diam. 4 in.	Diam. 5 in.	Diam. 6 in.	Diam. 8 in.	Diam. 9 in.	Diam. 10 in.	Diam. 12 in.	Diam. 14 in.	Diam. 15 in.	Diam. 16 in.	Diam. 17 in.	Diam. 18 in.	Diam. 24 in.	Diam. 30 in.	Total Length.	Remarks.
Townships within the city—	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	
Manchester	491	2471	607	..	1554	130	..	..	..	..	48	..	..	314	381	1195	7181	
Cheetham	257	564	278	..	134	..	..	..	..	..	..	..	..	..	..	..	1231	
Hulme	1107	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1130	
Chorlton-on-Medlock	182	735	20	..	15	..	..	..	..	..	..	..	..	..	..	..	922	
Arldwick	17	312	270	..	39	..	..	..	11	..	..	..	..	..	..	..	649	
Beswick . . . . .	..	151	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1136	Yards laid—
Townships within the city	897	3560	1173	..	1742	120	..	..	11	..	..	..	..	314	404	1195	11261	Within the city.
Townships beyond the city	1622	6999	2755	..	1191	1048	..	..	1356	37	680	61	33	1063	10	486	17341	Beyond the city.
Total	2519	12359	3930	..	2933	1168	..	..	1367	37	728	61	33	1377	414	1681	28607	During the year.

Being 16½ miles and 7 yards.

Yards taken up—

Within the city.

Beyond the city.

During the year.

Being 34 miles and 126 yards.

Laid during the year 1879-80	2519	12359	3930	..	2933	1168	..	..	1367	37	728	61	33	1377	414	1681	28607	
Taken up during the year 1879-80	1043	1663	1439	218	413	..	35	9	477	..	501	..	..	..	..	..	5846	

Net increase during the year ending June 24, 1880, 22,761 yards; being 12½ miles and 321 yards.

Summary.

	Diam. 2 in.	Diam. 3 in.	Diam. 4 in.	Diam. 5 in.	Diam. 6 in.	Diam. 7 in.	Diam. 8 in.	Diam. 9 in.	Diam. 10 in.	Diam. 11 in.	Diam. 12 in.	Diam. 13 in.	Diam. 14 in.	Diam. 15 in.	Diam. 16 in.	Diam. 17 in.	Diam. 18 in.	Diam. 24 in.	Diam. 30 in.	Total Length.
Pipes laid to June 24, 1879—	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.
Within the city	263492	130623	52833	14687	31677	738	14842	13455	1456	279	31086	309	7322	4770	3993	55	5755	324	477	7310
Beyond the city	161254	83177	59360	6394	33399	410	29000	13713	1327	1808	21470	..	749	441	..	..	5164	..	..	59923
Pipes laid during the year ending June 24, 1880—	424656	214002	111273	21281	65076	1148	44482	27168	2783	2087	25256	309	7971	5111	3993	55	10919	324	477	8315
Within the city	897	3560	1175	..	1742	..	..	..	..	..	11	..	..	..	..	..	..	..	..	1185
Beyond the city	1622	6999	2755	..	1191	1048	..	..	..	..	1356	..	..	..	..	..	..	..	..	486
Deduct pipes taken up during year ending June 24, 1880.	427175	226361	115203	21881	68009	1148	45650	27168	2783	2087	25923	309	8008	5839	4054	88	12296	324	477	8729
Total	1043	6613	1439	218	413	..	35	9	477	..	501	..	..	..	..	..	..	..	..	5846
Total	420132	224698	113764	21063	67596	1148	45650	27133	2774	2087	25346	309	8008	5838	4054	88	12296	324	477	8681

(Total, 1,033,585 yards; or 587½ miles and 25 yards.)

[APPENDIX E.]

Statement showing the Amount of Gross Profit, and the Mode of its Appropriation; also the Amount of Borrowed Money Owed, and the Excess of Assets, &c., from the Year 1862 to the present Date.

Year ending June 24.	Profits.	Maximum Price of Gas, per 1000 Feet, within the City.	Appropriation of Gas Profits.	Amount advanced to Improve-ment Committee in anti-cipation of Profits.	Retained towards Repayment of Advances made to the Improve-ment Com-mittee in anti-cipation of Profits.	Carried to Reserve- of Funds to meet future Contingencies.	Balance owing of Amounts advanced in anti-cipation of Profits.	Borrowed Money Owed.	Amount charged to Revenue in respect of Depreciation of Works and Mains.	Excess of Assets.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1862 42967 7 1	4 0	15482 3 2	10330 14 4	7454 9 7	7454 9 7	..	..	..	12179 4 6	126391 4 6
1863 55894 12 9	4 0	14932 17 8	18609 17 4	22261 17 9	22261 17 9	..	..	..	16266 18 11	145201 1 10
1864 59548 18 9	4 0	13888 12 10	17810 1 0	27847 4 11	27847 4 11	..	..	..	12690 12 9	165011 2 10
1865 56142 4 3	4 0	13096 10 9	17587 0 11	25758 12 9	25758 12 9	..	..	..	13505 6 6	180508 3 9
1866 52558 2 10	4 0	13253 13 0	19784 2 0	19516 7 10	19516 7 10	..	..	..	34772 2 11	138517 2 9
1867 47328 0 4	4 0	14167 11 7	19898 0 4	13257 8 3	13257 8 3	..	..	..	331725 9 7	14628 8 6
1868 48546 4 7	4 0	14514 17 9	20246 0 5	14885 6 3	14885 6 3	..	..	..	331035 10 4	15173 2 5
1869 52736 18 4	4 0	13467 12 6	20688 14 4	14580 11 6	14580 11 6	..	..	..	24363 8	139469 8 5
1870 65348 10 8	4 0	16784 13 8	24487 6 0	24071 11 0	24071 11 0	..	..	..	28113 8	143294 1 9
1871 73622 9 2	4 0	18329 6 5	27050 15 11	33842 13 1	33842 13 1	..	..	..	22191 6	1144859 9 5
1872 63257 9 7	4 0	16390 10 6	27800 15 11	40911 14 2	40911 14 2	..	..	..	34547 7	245938 9 8
1873 69063 0 6	4 0	13413 7 1	25588 19 6	16600 13 11	16600 13 11	..	..	..	32126 8	846046 11 0
1874 77465 12 2	4 0	18861 15 3	28977 9 6	29626 9 5	29626 9 5	..	..	..	52309 18	0 457834 5 0
1875 106987 6 3	4 0	17182 18 8	28514 17 11	61109 9 10	61109 9 10	..	..	..	433210 2 0	29908 7 0
1876 101232 4 6	4 0	16185 10 8	28070 2 5	56976 11 5	56976 11 5	..	..	..	105562 14 1	29491 7 5
1877 100530 16 7	4 0	15518 2 1	27299 18 8	57291 18 10	57291 18 10	..	..	..	377359 2 6	24021 13 9
1878 116142 14 4	4 0	13069 14 2	27408 18 7	60115 10 7	60115 10 7	..	..	..	457028 17 4	25194 19 6
1879 105113 14 4	4 0	18084 19 1	28736 15 7	46890 3	2101 16 0	29068 0 7	..	..	550580 9 6	35466 0 9
1880 119818 11 3	4 0	24019 7 2	29246 14 1	50387 18	106449 11 10	1612 2 0	..	..	538512 8 10	26771 15 2
Tot. 1332601 18 7	..	312492 5 4	462562 1 9	608990 13 8	8550 17 10	4610 1 9	92322 19 4	..	18775 10 4	..

Less amount transferred, 4610 1 9

THE TOWN OF LILLE IN DARKNESS.—On the evening of Monday last week the town of Lille was suddenly almost plunged in darkness by an accident at the gas-works, by which the pressure became insufficient to force the gas in the necessary quantity to a distance. Candles had to be lighted in the cafés and shops, and there was quite a run on the grocers for these useful household articles. About midnight the accident was repaired, and the streets resumed their usual appearance.

THE COSTS OF THE EXETER CORPORATION GAS BILL.—At the meeting of the Exeter Town Council on Wednesday last—the Mayor (Mr. W. H. Ellis) in the chair, Alderman Thomas moved, pursuant to notice—"That the resolution of the Council of the 28th of July, 1880, directing payment of the Parliamentary Agent's costs in relation to the Exeter Corporation Gas

Bill, 1878, be rescinded." Alderman Daw seconded the motion. Mr. Dawke observed that £150 had already been paid on account of the bill, and he should be glad to know, if the rest of the bill was illegal, whether the sum paid on account was legal. The Town Clerk replied that the time for questioning that payment had gone by. Mr. Andrew apprehended that the Town Clerk had incurred the costs in obedience to the directions of the Council; and were they as a body to leave this matter on the shoulders of the Town Clerk and repudiate their own acts? He had no sympathy whatever with outsiders or insiders who, having given instructions to incur certain costs, repudiated their liability. Under the circumstances, he should be prepared to bear individually his part in the payment of these costs. The resolution of Alderman Thomas was carried.

NORTH OF ENGLAND GAS MANAGERS ASSOCIATION.

The Twelfth Half-Yearly Meeting of this Association was held at Sunderland on Saturday, the 2nd inst.—Mr J. H. Cox, President of the Association, in the chair.

The SECRETARY (Mr. W. Hardie) having read the notice convening the meeting, and the minutes of the last meeting having been confirmed, the following gentlemen were unanimously elected members of the Association:—

Mr. Robert Brass	Gas Manager	Tudhoe.
" John McKenzie	"	Morpeth.
The unmentioned gentlemen were elected associates:—		
Mr. H. B. Churrows	"	London.
" R. B. Charlton	"	Newcastle.
" J. R. Forster	"	"
" G. H. Herbert	"	"
" H. Tomkinson	"	Sunderland.

The President then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—For the honour you have conferred upon me by electing me your President, and for having selected Sunderland as your place of meeting, I most cordially thank you. The continued success of the North of England Gas Managers Association is a subject for hearty congratulation, and it is to be hoped that every gas manager within its pale will strive to enhance himself as a member. Few professional men are so isolated from each other as gas managers; but these meetings bring them together, where they can compare notes, interchange ideas, and investigate discoveries as they may arise in the mechanical and chemical appliances of their business, and where each returns to his own particular sphere of action, it will be with his capacity of usefulness increased, and his mind enriched by information gained from the experience of others. A generous emulation is by these means established, and it is whilst striving after skill and excellence in his profession that a manager is enabled most successfully to perform his duty to his directors and the public.

As showing the progress made by the gas companies in this neighbourhood, I may mention the opening of the new gas-works for the Bishop Auckland District Gas Company; also the new retort-house and other considerable extensions at the Hendon station of the Sunderland Gas Company; and, though not least, the commencement of operations at the Jarrow station of the South Shields Gas Company, where may be seen in full operation the improvements in machinery and apparatus for charging and drawing retorts, the invention of our friend Mr. Warner. I am sure we all wish that the ingenuity and enterprise of that gentleman may be continued with equal success in the future.

The various exhibitions of gas apparatus in the large centres of the kingdom have done very much to popularize and increase the use of gas-cooking stoves and gas-engines, and there is an exhibition of apparatus for the utilization of gas, electricity, &c., being held in Glasgow, which, I understand, is a worthy rival to a visit from all directors, managers, and other interested in the economical application of gas.

Thanks to the scientific labours of Sugg, Bray, and others, improved methods of street illumination are being extensively adopted in crowded thoroughfares in many large towns, and no doubt the success which has already been obtained will cause a rapid development of the system. It is clearly proved that gas, well used in sufficient quantity, and consumed under proper conditions in suitable burners, can afford all the illumination which, under ordinary circumstances, it is necessary to have.

No prominent measure affecting gas companies has been brought before Parliament during the past session, if not the employment of gas by labour. But which includes in its provisions gas companies as well as all other employers of labour. Gas managers are generally very careful to provide against the risk of loss of life or injury to their workmen, therefore it is not apprehended that the Act, if fairly carried out, will entail much expense upon the companies. The principal danger—one probably resulting from the Act, is the pecuniary one, namely, that, on the occurrence of an accident, however apparent may be the cause, the party injured, instead of endeavouring to effect an amicable arrangement with his employer, may be induced, without proper notice, to commence litigation, by one of that class which has a representative in most large towns (Sunderland, I hope, excepted), to whom his case is of more importance than the interest of his client. Probably, in nine cases out of ten, a sufferer by an accident would receive a much larger net amount into his pocket if he left himself in the hands of a company, than if such payment had to be made in obedience to the verdict of a court of law. Gas managers should be in a ready state of defence, and, so well to study the Act, and take every precaution to prevent coming under the operation of its penal clauses.

As manufacturers whose staple raw material is dug out of the bowels of the earth, we are, under any circumstances, much interested in the production of coal and its proper use in the present occasion, located in the heart of the northern coal-field, and within a few miles of the scene of the most disastrous colliery explosion of modern times, we cannot do less than record how deeply we deplore the melancholy loss of those 162 hardy sons of toil, who, at Seaham Pit, on the morning of the 8th ult.,

"Hidden away from the merciful sun

Met death and doom in one

and offer our heartfelt sympathy to their bereaved and sorrowing relatives. Our admiration is excited by the acts of that brave party of explorers, who, ignoring all danger to themselves, boldly faced death in the hope of rescuing the entombed miners.

Looking at all the circumstances in our favour, and carefully and judiciously discounting all that may be considered adverse, we cannot but arrive at the conclusion that there is a great future yet in store for gas enterprise. The ease with which gas is manipulated, its now almost universal use in private dwellings, its gradual adoption as a motive power and for cooking purposes, and its cheapness, are irresistible arguments in its favour.

In conclusion, I beg to remind you that we are near classic ground. From the banks of our own river, the Wear, a short distance from this spot, was written one of the earliest appeals in favour of the consumption of gas, on account of its local interest and humour, and the celebrity of its author. I trust you will excuse his reproaches. On Dec. 21, 1821, Mr. Lambton Smith thus wrote to Lady Mary Bennet:—"From these words—Lambton—and here I ask what use of wealth so luxurious and delightful as to light your house with gas? What folly to have a diamond necklace and a Correggio, and not to light your house with gas? The splendour and glory of Lambton Hall make me envious when I repose myself. How difficult to submit to a farthing candle existence when science puts such intense gratification within your reach. Dear lady, spend all your fortune in a gas apparatus. Better to eat dry bread by the splendour of gas than to dine on wild beef with wax candles, and so good-bye, dear lady." The enthusiasm which inspired the witty divine when he wrote the above has considerably subsided, but the sacrifices necessary to obtain what he so forcibly recommends have decreased in a still greater proportion.

Before resigning his seat, the President added that it had been suggested to him that as the Association were a very good financial position, they should show their practical sympathy for the sufferers in the recent accident at Seaham, by giving a contribution to the relief-fund. This proposition quite accorded with his own feelings, and he had great pleasure in moving that the sum of ten guineas be given to the fund. Mr. J. W. J. and Mr. J. W. J. seconded the motion, and he said he was at first that gas companies, being largely connected with the Durham collieries in their business, should have substantially aided the relief-fund; but as he was the adviser of a Company, he felt bound to say that he was afraid that directors, in their corporate capacity, could not legally make any such contribution to the fund.

The motion was carried unanimously.

Mr. J. T. JOLLIFFER (Sunderland) then read a paper on

THE UTILIZATION OF THE WASTE HEAT FROM THE RETORT FLUES, FOR THE GENERATION OF STEAM.

At one of the first meetings of this Association, Mr. Hepworth favoured us with a very valuable contribution to our proceedings, on preventable waste in gas-works. Although the subject of this paper is the generation of steam from the waste heat of retort-settings, I think you will agree with Mr. J. W. J. and Mr. J. W. J. that the subject was well so ably treated by Mr. Hepworth, and which in these days of keen competition we are all so much interested in—viz., economy in working.

The subject, as you are well aware, is no new one, and so I am unable to lay claim to the origination of any startling innovation. I find that a paper on "The Utilization of the Waste Heat from the Retort Flues in Gas-Works"—was to have been read at the meeting of the British Association of Gas Managers last year, by Mr. P. M. Harris, of Falmouth; but unfortunately, for want of time, it was taken as read. This personally very much regret, for possibly the discussion which would in all probability have arisen might have brought out some interesting information on the subject; at any rate, it would have enlightened us as to that extent this means of raising steam is carried. My reading of that paper in the Transactions of the parent Association, if it did not suggest to me the idea, certainly revived one that had for some time lain dormant; and during the summer just passed, when something like a coke famine occurred in the immediate neighbourhood, a very good opportunity arose for giving the idea a practical trial.

Having obtained permission to see to what extent it was practicable, I furnished up an old Cornish boiler that was lying in my yard, and had it thoroughly examined and put in working order. The boiler was 12 ft. in diameter, and 20 ft. in length, and was constructed of wrought iron, but against mishap, it was fitted with two safety-valves, steam whistle to blow off at low water and high steam, two sets of gauge-cocks and glasses, and a Bourdon steam pressure-gauge. I decided on placing the boiler in one of the arches where ordinarily a setting of retorts would be, I fixed it so that the boiler was between the two arches, the retorts on the round side, under the bottom, and up the other side to the main flue. The waste heat was diverted from the main flue by the aid of dampers, and made to travel down through an opening in the top of the arch, the way stated—viz., through and round the boiler up again to the main flue. The steam-pipe from the boiler was carried by a 6-inch pipe a distance of some 250 feet to the engine. The steam-pipe was coated for part of the distance with a material with the composition of which I am not acquainted, but which was a moderately good non-conductor, and part of the way with ordinary fire-clay mixed with hair, which was not so good; the temperature of the outside of the steam-pipe where coated with the composition ranging from 30° to 35° Fahr. above the atmosphere, and where coated with fire-clay it was considerably more.

Everything being in readiness, I diverted the waste heat from one through setting of 7 retorts, and in course of six hours had the satisfaction of seeing that the quantity of steam generated was sufficient to drive the waste heat from one setting was not sufficient, so I added the waste heat from another bed, and was soon able to raise steam enough to drive my pumping-engine. This was equivalent to a saving of from 10 to 12 cwt. of coke per day. Fully satisfied with the success so far, but still not completely satisfied, I arranged, I added the waste heat from another bed, and had the satisfaction of being able to drive my exhaust-engine in addition to the pumping-engine. This, it must be understood, was during the summer, and with the make of gas at its minimum.

It is here that I have to recount an element of failure. I found that, although getting as much steam as I could, the waste heat from the draught necessary for the retort-settings. To remedy this I removed the division in the brickwork at the end of the boiler, and allowed the heat to pass through the tube or round the sides. This completely cured the evil, and for some short time sufficient steam was raised to do all the work; but as the season advanced, and the work increased, I found the boiler was not sufficiently large—a result not at all unexpected when the size of the boiler is considered—and so was obliged to content myself with using it as an auxiliary.

It is here shown that it is possible to raise steam for all purposes in the manner indicated, perhaps you will bear with me while I state the probable saving by the adoption of that method.

In a paper read by Mr. Corbet Woodall before the parent Association, in 1877, on the cost of exhausting gas, Mr. Woodall showed as the result of his experiments that with a non-condensing engine, and a pressure of 2½ lbs. of steam, it could be raised to 100 lbs. of steam to exhaust 1000 cubic feet of gas against the pressure of a column of water 36 inches high, and that the expenditure of fuel bore a direct proportion to the pressure. With a view to ascertain how near I was working to the standard, I made a series of retort-settings, exhausting gas at considerable days. The coke was carefully weighed into the boiler-house day by day, and the make of gas duly noted. The average consumption of fuel was found to be 4½ lbs. per 1000 cubic feet, against a pressure of 20 inches. I was not quite sure what gave rise to this extraordinary consumption, but I imagined, I added the waste heat from another bed, so little work to do about one-fourth its actual power. I resolved to work carefully and to take note, as the make of gas increased, how the consumption of fuel was affected, and I found that my surmise was correct, for as the exhauster became more fully employed the consumption of fuel decreased to 1½ lbs. of steam per 1000 cubic feet, and the pressure of 2½ lbs. of steam to exhaust 1000 cubic feet of gas, and the coke to exhaust the gas was reduced from each ton of coal, and the work necessary tar and liquor pumps, &c.,

I will assume, therefore, that 2½ lbs. of coke will generate sufficient steam to exhaust 1000 cubic feet of gas, and in practice it will be found considerably more, owing to the varying speed at which the exhauster has to travel to adapt it to the requirements of the season—and another 1½ lb. of coke is needed to raise sufficient steam to work the tar, liquor, and water pumps, and the numberless other purposes for which steam is in general use in all gas-works. Each ton of coal produces 10,000 feet of gas, and each 1000 lbs. of gas, so that to exhaust the gas, it is required from each ton of coal, and the work necessary tar and liquor pumps, &c.,

needs an expenditure of 30 lbs. of coke, or about 2 per cent. of the total quantity produced, to those who, like myself, have to manufacture sulphate of ammonia by the aid of steam, the saving will be considerably more. I find that for each pound of sulphate produced, something like 2 lbs. of coke is needed, and taking the yield of sulphate at 18 lbs. per ton of coal, we have 36 lbs. of coke used as fuel, which added to the 30 lbs. already used for exhausting gas, &c., brings the total quantity to 66 lbs., or about 4·5 per cent., and this I am convinced is not at all an excessive estimate.

Whether the class of boiler I have is the best that might be used for the purpose, I am unable to say. As I have already stated, it was one that was suggested, or suggested to me, by my yard, and it was with a desire to experiment. Mr. Harris is his party, gives it as his opinion, that the plain cylindrical boiler is the best. I rather incline to the Cornish, with the addition of Galloway tubes, ears being taken that the area of the tube or tubes is in excess of the area of the retort-flue. Neither am I prepared to say that the position I have chosen for the boiler is the best. Mr. Harris has his fixed on a flue parallel to the main flue, and next the chimney. This position, in my case, was impossible. I have through settings, and the inaccessibility of a boiler so placed would be a fatal objection.

In adopting the above, I have added another boiler similar in size to the one already in use. This addition necessitated altering the position of the boiler. The arch in which the first one was set is not sufficiently large to accommodate both, and as I did not feel justified in taking up more room in the retort-house, I have set the two side by side in a new arch, built on the way between Mr. Harris, in his paper, only at the end of the house instead of near the chimney. With this addition I am enabled to raise nearly sufficient steam for my present wants.

In conclusion, I trust that the few facts I have laid before you are not altogether devoid of interest, and that they contain matter of some moment to all. In drawing your attention to the immense amount of heat going to waste from our retort-flues, I have endeavored to show a means whereby part of it may be utilized, and thus we may be enabled to keep on towards that end for which we all so earnestly strive—viz., lessened cost of production.

Discussion.

Mr. W. FENN (Stockton-on-Tees) said he was sure they had all listened with great pleasure to Mr. Jolliffe's paper, and he would be glad to hear, at some future meeting, of the success of his scheme. The only obstacle he had found to the utilization of the heat had been the interruption to the heat of the furnace. If the method was injurious to the generation of gas in the retorts, the economy would cease, but if Mr. Jolliffe was able to get over this, and not this effect, he was sure he deserved their warm thanks for the paper he had read.

Mr. V. WYATT (London) said every one must be struck by the immense waste of heat passing the retort flues, causing thousands of tons of coal to be consumed without any motive power resulting. When man could hit upon a way by which a portion of this waste heat could be secured, the result would be to put gas-works in so economical a position that companies would be able to produce and sell their gas cheaper than they were now doing. The saving would of itself in some cases amount to a dividend.

Mr. A. G. ROE (Newcastle-on-Tyne) said he thought Mr. Jolliffe had hit upon the right kind of boiler to be used—the Cornish one. He thought, too, he had tapped a seam which, if properly worked, might revolutionize gas manufacture in this country.

Mr. JOLLIFFE briefly thanked the various speakers for the complimentary manner in which they had alluded to his paper.

(To be continued.)

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

As briefly announced in our "Trade Notes from Scotland" last week, the Seventeenth Half-Yearly Meeting of this Association was held on Friday, the 1st inst., at Port Glasgow—Mr. R. S. Carlrow, the Manager of Port Glasgow Gas-Works, in the chair.

After the transaction of some formal business, Messrs. Alex. Ross, of Burntisland, and Alex. Waddell, of Kirkcaldy, were admitted members of the Association.

The President, in his inaugural address, gave a brief historical account of the town in which the Association had assembled, and thereafter he dwelt upon the necessity of economy in the gas retort-house. He discussed the question of mechanical stokers *versus* hand labour, and argued at some length that the machines must be simpler in construction and more readily applied to existing settings of retorts before they could be generally adopted. He also contrasted the question of gas lighting as against electricity, and pointed out that while the latter method might eventually come to be applied to large spaces, it would not, so far as they could at present see, successfully compete with gas. He thought, further, that if gas companies would only encourage the consumption of gas during the hours of daylight, not only would gas-works be employed during hours when they are at present unemployed, but the employment would do much to enable companies to reduce the price of gas.

Mr. Brown (New Cumnock), in moving a vote of thanks to Mr. Carlrow, said it was the duty of gas managers to do all in their power to get the inhabitants of their respective towns to visit the exhibition of gas apparatus, as in doing this they would be forwarding the interests of their profession.

Mr. Robert Mitchell (Coatbridge) read a paper on the valuation of gas-works, in the course of which he pointed out the absence of similarity in the valuation of works, and argued that a general rule ought to be laid down so that one works should not be rated higher than another. Mr. D. Jeffrey (Kirkintilloch) suggested that gas companies should join together and raise the question in the Supreme Court, in order that a decision of the point at issue might be obtained. Mr. S. Dalziel (Kilmarnock) then read a paper on the treatment of residual products. He showed that gas-works, by erecting the necessary plant, could realize a handsome profit. Mr. D. Bruce Peebles (Edinburgh) read a paper upon, and described his new system for ascertaining the consumption of gas in street-lamps; and Mr. J. M'Gillchrist (Dumbarton) explained his improved photometer meter disc.

The above-mentioned papers, with the discussions which followed their reading, we shall publish as usual in the JOURNAL.

In the evening the members of the Association dined at the Star Hotel, where Mr. Carlrow presided, and Mr. Dalziel discharged the duties of crozier.

THE WATER SUPPLY OF CHURCH COPPENHALL, CHESHIRE.—It is stated that a serious outbreak of fever has occurred at the above-named place, attending the drinking of foul water; and the extraordinary statement is made that, though the Sanitary Committee of the Northwich Union have put down pipes by which a supply of pure water is brought into the village from Crews, many of the landlords and tenants have refused to have the water laid on.

WALSALL CORPORATION GAS SUPPLY.

At the Meeting of the Walsall Town Council on Monday, the 4th inst., the Mayor, who occupied the chair, proposed that, pursuant to a recommendation of the General Purposes Committee, the sum of £7000 should be transferred from the accumulated profits of the gas undertaking to the borough fund, and that the Council should direct that no borough rate be made this year.

Alderman BREWER having seconded the motion, The Town Clerk, in reply to a question as to what sum was wanted for the borough rate, said that last year it was 7d. in the pound; but it would have been 1s. 3d. in the pound if it had not been for £4000 transferred from the gas profits to the borough fund. He said that the foregoing, not merely a sevenpenny one, but a fifteenpenny one, if it was decided to give up the entire rate. This would extend to February next, when the Committee recommended that the whole question should be reconsidered, so as to decide whether that quarter should also be free. In reply to a further inquiry, he added that the profit of the year was £4000. The £7000 was the estimated result at the end of the year, as during November and December a large floating balance—from £8000 to £10,000—would be required, but afterwards it would be less. There was no doubt of the £4000 profit.

Alderman BRIDGILL (Chairman of the Gas Committee), in reference to a question as to the extra 6d. per 1000 feet charged at Bloxwich, said that this extra amount only produced about £500; while the district over which it was charged got back one-third of the £7000. He thought that £2550 was a pretty good return for the extra 6d. It might seem like a joke, but it was a fact, and was true. Bloxwich was a district of 6000 of the £7000, and only paid for 11 million feet of gas. In fact Bloxwich paid one-eleventh of the amount received from the sale of gas, and got back one-third of the profit made.

The resolution was then put and carried unanimously.

THE GAS AND WATER SUPPLY OF GOOLE.

On the afternoon of Friday, the 1st inst., a Special Meeting of the Goole Local Board was held for the purpose of again considering the gas, water, and sewers question, and for discussing the result of the interview with Mr. Bartholomew, Engineer of the Aire and Calder Navigation Company, and the Board's Elementary Agent. The Rev. Mr. BULL presided.

The CLERK commenced the proceedings by reading a report of the interview referred to, in the course of which it was stated that the Committee charged with the business were convinced "that the Aire and Calder Navigation Company had no selfish wish to part with their gas-works, but they were increasing in value every year, and were one of their most profitable sources of income; but they did not hide from themselves the responsibility that attached to them in relation to the moral and physical welfare of the inhabitants of Goole, and were, therefore, most anxious to further a scheme for the supply of a sufficient amount of good and wholesome water for their use. Knowing that this could not be effected without a large outlay of money, and that it would embarrass the ratepayers to do so, it struck them that if they could transfer to a Company in which the Local Board could have an interest to the amount of a third portion of the shares, this would materially help them to make their annual payment of borrowed money, and require them to borrow much less sum." The report concluded by saying that the Committee were authorized to state that the Aire and Calder Company would not accept less than the amount named for the works.

A statement of the financial results of the gas supply was also produced, from which it appeared that the profits of the past three years, 1877-79, were £1810 3s. 8d., £1954 0s. 2d., £1932 12s. 10d.; or an average of £1899 2s. 2d. Seventeen years purchase of this would amount to . . . £32,283

To this must be added the capital expended in 1879 . . . 2,961

£34,644
Add for extra land for Bridge Street gasholder, 7726 yards at 5s. 1,931

£36,575
Deduct overcharge in account for Navigation Company's lamps 2,397

£34,283
Seventeen years purchase is equivalent to 64 per cent.

The CHAIRMAN read the following extract from a letter addressed to him by Mr. Bartholomew after a meeting of the Navigation Company the previous evening.

The Navigation had under their consideration last evening the question of the price fixed for the gas-works in connection with their three proposals to the Goole Local Board, and I am desired to say that they have carefully considered the views held by the Board, and the arguments which you have from time to time so urgently made on their behalf, and whilst they feel the offer made—viz., £34,238—is a fair and liberal one, yet having regard to the feelings of yourself and the Board, and the well-being of the town, they are desirous that the sum to be inserted in the contract for the gas-works should be £33,000 exclusive of stores—coal, coke, gas water, &c., or refining materials in stock at the time of transfer—which must be taken over at cost and contract dividend price.

In conclusion, I am to add that, the time for preparing a Bill for introduction next session being so short, this final proposal of the Navigation can only be left open for the Board's acceptance until the 15th inst.

The CHAIRMAN then gave much talk on the matter proposed, and Mr. BENNETT seconded, the following resolution:—"That after hearing the report of the interview and the Company's letter of this day, the Board are prepared to purchase by valuation in the usual way, but not at a sum fixed by the Company; and subject to the heads of arrangement of the scheme for the gas-works being approved by the Local Government Board and Parliament."

Mr. COUSE submitted the following amendment—"That as the price fixed by the Company is too high, and they decline to go to arbitration, the Board declines the Company's offer."

The motion was seconded by Mr. HICKMAN; but after some further remarks, during which Mr. Coose refused, at the request of the Chairman, to withdraw his amendment, the motions were put, and the one by the Chairman was carried.

On Tuesday last, at the Ordinary Meeting of the Board, the CLERK read the following letter from Mr. Bartholomew with regard to the resolution given above:—

G. England, Jun., Esq., Clerk to the Goole Local Board.
Dear Sir,—I have to acknowledge receipt of yours of the 1st inst., enclosing copy of a resolution of the Goole Local Board, conveying the decision of that body, on Friday last, in regard to the several proposals of the Navigation Company.

Were the questions involved ordinary ones, the Navigation would accept the decision of the Board as final, but inasmuch as the health and material prosperity of the inhabitants so largely depend upon a solution of the point in difference, the Navigation are induced to make the following observations and suggestions for the consideration of your Board.

While the Navigation cannot now submit the price to be paid for the gas-works to arbitration, having already offered them to the Board at a price considerably below their

Leeds, Oct. 4, 1880.

46s. 6d. to 47s. 6d. per ton, less 21 for delivery equal to Manchester; but Lincolnshire and Derbyshire iron are to be bought at 1s. to 2s. per ton under these figures. Finished iron is moderately steady, but there are very few new orders coming in, and makers would take prompt specifications at under present rates. For delivery into the Manchester district bars are to be bought at from £5 17s. 6d. to £9 per ton.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Quotably no alteration in the price of coal has been made in this district, though it was expected at the recent meeting that some alteration would take place. The demand is said to be slightly improving for several qualities. Nevertheless there are a large number of pits at which not more than a quarter of the quantity which might be raised is now being drawn. Such is the case with the pits banks, too, in many parts of the district are unusually large. Furnace fuel is still in good request, the prices ruling are, however, extremely low. At several pits where the operations have been suspended for some months the water has so risen as to preclude any renewal of mining until an expensive course of pumping has taken place. At a meeting of the Mines Drainage Commissioners, held on Wednesday last, the Chairman referred to three pits into which water had run to such an extent that it would cost £2000 a year to pump it out again. It is estimated that in the Tipton district alone the cost of pumping for the current year will exceed £17,000. To a number of unworked pits there will doubtless be additions unless a greater improvement in the demand speedily takes place.

The iron trade is reported less active. At the meeting held at Wolverhampton, on Wednesday, and at Birmingham, on Thursday, there were good attendances, but business was dull. The chief feature of the week was a decided drop in the price of market bars, which now leaves them at £7 10s., excepting the 1½ of the Earl of Dudley, which are now £8 2s. 6d. The new rates concern at once. The price of 24-gauge sheets will be 49; 26-gauge, £10; and 28-gauge, £11. The pig trade is dull, and it is thought that several buyers who have been withholding orders are now willing to complete contracts. Cast iron and classes of manufactured iron are more inquired after than has been the case during the past few weeks. Iron-steel is in slow request, and but little Middlesbrough iron is in the market.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The position of the coal trade throughout Yorkshire was scarcely ever in a more critical state than it is at the present time. In particular bearing evidence on every hand of the ruinous state of trade. On Friday official advertisements were issued, stating that a petition for the winding up of the Silkstone and Dodworth Coal and Iron Company, Limited, had been presented to the Chancery Division of the High Court of Justice by Mr. Henry Smith, timber merchant at Hull, and a petition will be heard on the 6th of November. The Company was started in 1872 or 1873 with a capital of £300,000 in 6000 shares. As the collieries at Dodworth and Higham employ about 1000 men and boys, in addition to those engaged at the Company's iron-works at Wingfield, in Derbyshire, it is to be hoped some arrangement will be made to prevent the working of a large. A special circular has also been issued to the Shareholders connecting with the Thorpe Gawber Hall Collieries, Limited, calling a meeting of the Directors in London on Tuesday next, for the purpose, it is stated, of "affording them the earliest opportunity of communicating to the Shareholders important information which requires their consideration and sanction." In the meantime 20 of the horses and ponies, with other things belonging to the Company, are announced to be sold by public auction at Barnsley under a distrain for rent.

The quantity of both Silkstone and Barnsley thick coal which is being sent to London parlakes of the improvement now manifesting itself in the coal trade. There is also rather more doing with the Eastern Counties as well as other places. It is rumoured that an attempt is being made to advance the price; but it is to be feared that the vast output and the overstocked markets this will be difficult to maintain.

The steel coal trade is being well maintained, considering the period of the year. There is a good tonnage sent to Grimsby from South Yorkshire, and to Goole from the West Riding pits. The Hull trade is keeping well up, 45,575 sent during the month of September was 112,224 tons, viz., 45,470 by water, and 66,945 tons by rail. The Denaby Main Colliery, again, has resumed work, and is having considerable output of water. The West Riding Collieries, Manvers Main, Shiremoor, Lundhill, and other pits working a good quality of hard coal, are amongst the leading contributors. The official return shows that the largest exports have been sent to North Russia, Denmark, Germany, Italy, and other places.

The gas coal contracts which have been placed in various parts of the coal-field are in course of being executed, so that the quantity of this class of fuel raised is pretty large. Locomotive coal is also meeting a free sale, several of the largest railway companies being the best customers. There is no coal to be had for less than 10s. per ton, though the output is very large, there is a fair demand for North Lincolnshire, Sheffield, and other places where smelting operations are conducted. At several places improved machinery is being supplied for washing and crushing the coal and for sorting. There is no alteration in prices, which have of late been pretty firm.

A very unsatisfactory state of affairs exists between the owners of several of the collieries and their men. At the West Riding Colliery, Normanton, near Wakefield, belonging to Messrs. Pope and Pearson, the owners are asking for a reduction in the rate paid for getting coal, so as to place them on the same footing with the other collieries. The Silkstone Collieries. A 14 days notice has been given to the men employed at the Hoyland Silkstone Collieries, near Barnsley, who are employed in the Silkstone seam, to leave their employment on the 20th of October. In the face of these reductions and closing of pits, owing to the owners being unable to make them pay, the Yorkshire Miners' Association, and the Miners Union have summoned a special conference to consider the desirability of demanding a general advance of wages.

The iron trade presents no new feature of interest. There is still a large output of both, which meets a fair sale. At some places a moderate demand for merchant iron exists, while the Bessemer steel trade is lively. Some portion of the rolling mills have been idle for about a week. The Thorncliffe Works, which are noted for the production of gas and water pipes and gas apparatus of various kinds, are fairly off for orders in that department.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The gas coal trade from the Tyne has been somewhat kept back over the past few or ten days by stormy weather, and likewise through a scarcity of handy sailing vessels, which have been needed to carry gas coals coast-

wise. Some contracts have been made, but they have not been upon a very large scale. As most of the leading collieries are pretty fully contracted, there has been a trifling advance upon some special qualities of coals which have been needed, but it has not been very general, and where the rise has occurred it has been small. A steady trade is transacting, but as much of the business has been arranged beforehand, the changes which are expected to occur between this time and Christmas are not likely to be of much importance on the general run of the transactions. In a month from this the Baltic will be practically closed for the season.

Contractors who entered into large engagements to supply quantities of gas coals to the Russian gas companies have made an unfortunate speculation of it, so far as the shipments to Cronstadt are concerned. They calculated freight at a given figure, but it always kept beyond the estimate over the summer; and in October, on account of a failure of the grain crops in that empire, they are paying double what they estimated in freight to get the residue of their contracts away. Steam coals are in fair autumn demand. Coke, especially for consumption at the iron-works, continues to occupy a better position in the market.

The home freight market has a slightly upward tendency, mainly on account of the scarcity of sailing tonnage, which does not arrive in sufficient force for the requirements of trade. At the same time orders for vessels to load gas coals do not remain very long in the market. The rise in freight is about from 3d. to 6d. per ton all round. This does not affect the London supply, which is carried, as a rule, by regular steamers mainly belonging to the collieries or the gas contractors.

The Cleveland iron trade fluctuates at present, but manufacturers fail to establish much of an advance in the prices. They have been a little stiffer in the finished iron trade. Ironfounders have not received many new orders, however. They require more before they can keep their works regularly going.

The improvement in the fire-clay goods quality to fall off, and the trade is now slack, especially in second-class qualities. The chemical market shows no improvement. The speculative element is entirely out of it for the present; except in the one article of soda, prices have hardly altered 1 per cent. over a month. This market was very much weakened with over-speculation in the early part of the year, and it has not recovered the effects of it. Lead has shown a tendency to advance, but this is very much the effect of speculations which are not likely to stand. The timber trade is unchanged. A speculative attempt to run prices up has failed.

OPENING OF NEW GAS-WORKS IN HEREFORD.—The ceremony of opening the new gas-works which have been for some time in course of construction for the Hereford Corporation was performed on Tuesday last. The works appear to have given entire satisfaction, and we shall take an opportunity, in the next number of the JOURNAL, of referring to the subject at greater length.

THE WATER SUPPLY OF BLACKPOOL.—At the meeting of the Blackpool Town Council last—the 16th of May (Alderman McNaughton) in the chair, a Committee who had been appointed to consider the subject of the water supply of the borough, and to visit the Fylde Water-Works reservoirs, reported that they had submitted to Dr. C. Brown, of Liverpool, samples of the water supplied by the Fylde Water Company, and the results of the analysis of the water not being satisfactory, they considered, and reported, they had inspected the reservoirs, and recommended that the Company be requested to adopt a satisfactory system of filtering the water supplied to the borough, to provide additional means of conveying and maintaining an efficient and regular supply, and prevent any possibility of over-supply of water from the Calverley Reservoir, and the report was adopted, and instructions given to the Clerk to the Council to the directors of the Company.

THE MANCHESTER CORPORATION NEW GAS-WORKS.—The Gas Committee of the Manchester City Council on Monday last week paid a visit to the new gas-works, Bradford Road, in order to inspect a portion of the works which has just been completed. During the past two years four large holders have been in course of construction, and two are now ready to be brought into use. Each is 150 feet in diameter and 105 feet high, and is capable of storing nearly 2 million cubic feet of gas. The holders are 3-ft. and are each supported by 20 massive pillars, 107 ft. 6 in. high. The tanks are 37 feet deep, and each holds 3½ million gallons of water. The excavating was done by Messrs. Worthington; Messrs. R. Neill and Sons have the contract for the brick and stone work; and the ironwork of the holders of the Horsfield Iron Company, Limited, of Tipstaff, Staffordshire. It may be mentioned that each holder contains about 1000 tons of iron. One of the newly-completed holders was, on the occasion referred to, filled with air to its utmost capacity, and was much admired by the Committee. These two holders will be brought into use immediately for distributive purposes, the supply being obtained from the works at Rochdale Road. The other two holders will be completed in the course of the next twelve months.

THE WATER SUPPLY AND SEWERAGE OF AXMINSTER.—The Sanitary Authority at Axminster having resolved to provide a new water supply, and to properly drain the town, recently made an application to the Local Government for sanction to borrow £100,000 for the purpose of sewerage and sewage disposal, and £2500 for works of water supply, the result being that the Board sent down Mr. Arnold Taylor, one of their Inspectors, to hold an inquiry, which took place on Wednesday, the 29th ult. The Surveyor explained the plans of the proposed water-works, and said that from the three springs intended to be taken into use, the total quantity of water in 24 hours would be 17,000 gallons. From gauging the springs as late as May, 1879, he found that at the No. 1 spring there were 20 quarts flowing in 7½ seconds; at No. 2 spring, 20 quarts in 63 seconds; and at No. 3 spring, 20 quarts in 27 seconds. The population of the town of Axminster was at that time 1700 persons, and the supply 17 gallons per person per diem of 24 hours. He also gauged the springs in the month of September, 1877, and then he found that No. 1 spring produced 195 gallons per hour; No. 2 spring, 229½ gallons per hour. The reservoir would hold 40,000 gallons. The inspector said there was one question to which he would allude, namely, to see whether the water was to be charged for it. The whole parish would have to pay towards the expense of the sewerage and water works, and from the former there would be no return of money, and he certainly thought those who consumed the water should pay for it. After some further discussion, it was decided that the plan proposed by the Sanitary Authority and the Inspector should visit the springs, and that gaugings of the water should be taken. The Inspector made, the result being that the Inspector recommended that before the works were commenced, further search should be made, with the view of ascertaining for certain as to whether there would be sufficient water found at the places spoken of to supply the town. With reference to the sewerage works, the Surveyor said it was proposed to discharge the sewage on land belonging to the Lord of the Manor, for irrigation. After a few observations from the Inspector, the Clerk to the Sanitary Authority said he would ask, on behalf of the Authority, that the question of the disposal of the sewage should be adjourned for the purpose of revising the plans; and this was agreed to.

SINGULAR GAS EXPLOSION AT NEWPORT (MON.)—A singular gas explosion occurred at the Queen's Hotel, Newport, on Friday afternoon last. The kitchenmaid was in the act of cleaning a gas-cooking stove, which she evidently did not understand, as she allowed the gas to escape till it exploded with a loud report, and a force that made the house shake. The kitchen windows were blown out, and the contents of the room damaged, but this appears to have been the extent of the injury to the property. The kitchenmaid, in addition to being greatly terrified, sustained a contusion of the knee, but otherwise she is not believed to be seriously injured.

THE WATER SUPPLY AND SEWERAGE OF PONTFRAC—At the meeting of the Pontfract Corporation, on Thursday last, the Mayor (Mr. J. Moxon) in the chair—it was resolved to borrow £10,000 for works of sewerage. Mr. Barstow, with reference to the town's supply of water, said the wells were not failing, but the demand and much increased lately, owing to the great number of houses supplied. He advocated strongly the sinking deeper of the wells, which would yield a more plentiful supply. Alderman Robson favoured an additional pumping-station being erected, instead of interfering with the present supply, and this proposal seemed to meet with general approval.

WASTE OF WATER IN SELBY.—At a special meeting of the Selby Local Board on Friday, the 1st inst.—Mr. R. Blackburn, in the chair—it was reported that in consequence of the waste of water that had been going on in the town, the Water-Works Committee had made three inspections of their districts, with the view of reducing it. Although the inspection had, to a certain extent, been successful, yet the great loss of water still existing was of serious importance, it being at the rate of 6000 or 8000 gallons per head. A lengthy discussion ensued, and it was finally agreed that the figures contained in the report presented on the subject should be handed, with a record of the pumping of the engine, to Mr. Fenwick, C.E., of Leeds, for his consideration.

THE AWARD IN THE BIRMINGHAM GAS-WORKS ARBITRATION CASE.—At the meeting of the Oldbury Local Board on the 1st inst.—Mr. B. T. Sadler in the chair—the Gas Committee reported that a copy of a notice had been received from Sir Henry Hunt, stating that the award in the gas arbitration case was ready, and would be handed over to the first party applying for it on payment of £395 18s. 9d. The Birmingham Corporation having consented to pay half the amount, the Committee recommended the Board to take up the award on those terms, and draw a cheque for £197 19s. 4½d., the amount due from Oldbury. A letter was read from Mr. E. J. Hayes, the Town Clerk of Birmingham, stating that he had received instructions to take up the award in the gas arbitration, and to furnish the Oldbury Local Board with a copy of it; the vendors and purveyor paying the charges in equal proportions, as was done in the case of West Bromwich. On the motion of the Chairman, it was decided to grant a cheque for the Oldbury share of the expenses, and the Clerk was instructed to take the necessary steps to obtain the award.

THE WATER SUPPLY OF PAIGNTON.—Some complaints having arisen as to the purity of the water supplied to Paignton, the Local Board determined on having samples of the water analyzed. This was accordingly done, and at the meeting of the Board on Monday last week, the report of the Analyst (Mr. E. Smith, of Torquay) was presented. It stated that two of the three samples of water submitted to him were free from all organic and inorganic impurities, were thoroughly sound and wholesome, and might safely be used for potable or any domestic purpose. The other sample was free from inorganic impurity, but yielded slight indications of organic impurity; not sufficient, however, to render the water unfit for use. This organic matter was in an unoxidized condition, and was therefore most likely derived from a source not far distant from the place whence the sample was taken—possibly from a nautical cistern or other receptacle. On standing, all three samples deposited a fine greyish-white matter, which under the microscope was found to be chiefly amorphous vegetable debris. Efficient filtration would therefore be desirable. The report was received.

SEWER VENTILATION BY STREET LAMP-PILARS.—Mr. C. S. Robinson, the Engineer and Manager of the Leicester Corporation Gas Works, in a letter to *The Times* on this subject last week, said: "In these days of steam rollers it is a very common thing for a gas-main to be broken, and for the gas to escape into the sewer in such quantities as to be very dangerous. Of course, such accidents are soon found out and remedied; but if Dr. Fitzgerald's plan of ventilating the sewer up the lamp-posts were adopted, the possibility is that in the meantime the lamp-glasses will sometimes explode the sewer when lighting the lamp. Attention has been called to the danger of fixing any sewer ventilators near windows. Allow me to suggest to your readers the great risk arising from the plan, frequently

adopted by architects and builders, of attaching soil-pipe ventilators to chimneys or near them, for, as every one knows, when there is no fire in a room, it is a very common thing to find a down-draught, especially in winter and in bed-rooms; and when sewer gas is allowed to escape near such a chimney, the air coming down the chimney will undoubtedly be contaminated with sewer gas."

THE WATER SUPPLY OF PONTFRIDG.—At the monthly meeting of the Pontfridd Urban Sanitary Authority on the 1st inst., Dr. R. Hopkins, the Medical Officer of the Board, submitted a report upon the water supplied by the Pontfridd Water-Works Company, respecting which there has been some complaint. The water supplied, he said, was that which was generally known as upland surface water, and when pure was wholesome, moderately palatable, and soft—in fact, eminently fitted for drinking and domestic purposes. The grievance was due to the scanty supply which had of necessity followed the long-continued drought experienced in that and other parts of the country during the last few weeks, as well as the brownish colour of the water, which was due to the peaty soil whence it flowed. The only impurities the water contained were carbonate of iron and some vegetable organic matter. The carbonate of iron, although found, did not obtain to such an extent as to impart a chalybeate taste to the water, and even if this was the case the principal symptoms would be a dyspeptic nature. He was of opinion that if the water had been properly filtered during the period of the scanty supply, not even the impurities referred to would have been found in excessive quantities. The water was perfectly free from what was by far the most important class of water impurities—viz., animal organic matter. The report was adopted.

BOLTON CORPORATION WATER SUPPLY.—The Bolton Borough Treasurer recently submitted to the Water-Works Committee his annual financial report on the receipts and expenditure of the water department. The receipts, it appears, amounted last year to £39,327 7s. 6d., as against £37,159 13s. 6d. in 1878-9, showing an increase of £2167 18s. 10½d. While the receipts last year were greater than the previous ones, the expenditure was less than in 1878-9 by £198 19s. 4d., the figures being £32,754 4s. 1d. and £33,953 3s. 5d. The receipts for last year were made up as follows:—To balance in hand, 1½d.; water supply for domestic purposes, £24,394 17s. 6d.; water supply for trade purposes, £10,633 5s. 4d.; water supply for building operations, £132 7s. 6d.; Local Board—Leigh, Hindley, &c., £2443 19s. 6d.; casual supplies, £18 2s. 10d.; rent of Entwistle and other farms, &c., £86 9s.; hay grass sold, 4½d.; filling reservoirs, &c., £16 8s. 4d.; fishing rights, &c.; sundries, 49s. 9d.; fines charged for non-payment in advance, £278 3s. 5½d.; and titing trade report, £1264 8s. 11d. The following items comprise the expenditure—Drivers salaries, £4382 14s.; maintenance of works, £2117 5s. 10d.; rents and rates-charges, &c., £5718 7s. 7d.; rates and taxes, £2012 8s. 3d.; miscellaneous expenses, £517 8s. 7d.; interest, £18,694 16s.; sinking-fund, £927 17s. 2d.; and instalment of public works loan, £1233 6s. 8d. From the above it will be seen that last year the receipts exceeded the expenditure by £6573 3s. 4d., and of this £1000 was placed to the renewal-fund, and £2500 transferred to the borough-fund on account, leaving an available balance of £3073 3s. 4d. Out of the profits the previous year nothing was placed to the renewal-fund, £3000 was transferred to the borough-fund on account, and an available balance was left of £1206 10s. 1½d.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

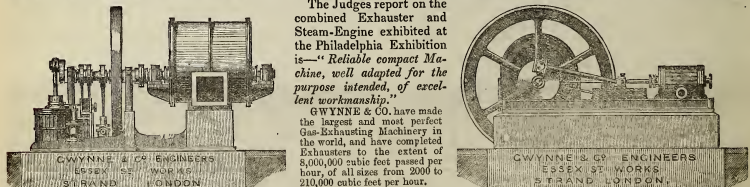
- 4027.—MILLS, B. J. B., Southampton Buildings, London. "Apparatus for checking the water of the water." A communication. Oct. 4, 1880.
4041.—GREEN, N. G., New York, U.S.A., "Improvements in the method of obtaining an increased water supply for cities, towns, manufactures, and for other purposes, and in apparatus for the same." A communication. Oct. 5, 1880.
4075.—CLAYTON, S., Bradford, Yorks., "Improvements in motor engines worked by gas or combustible vapour and air." Oct. 7, 1880.

PATENT WHICH HAS PASSED THE GREAT SEAL.

- 1661.—BENTON, J. G., Middlesbrough-on-Tees, Yorks., "Improvements in the distillation of coal and other substances, the manufacture of coke, charcoal, and 'patent fuel,' utilizing the gases therefrom, and in apparatus employed therein." A patent. April 22, 1880.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 19, 1880.

Circular to Gas Companies.

THE almanac affords sufficient explanation, if such were needed, of the importance ascribed by *The Times* to the letter of Dr. Alfred Carpenter, on the subject of London fogs, which appeared in its columns on Wednesday last. The season is now approaching when fogs may be expected as frequent visitors to the Metropolis—if, indeed, the plural is to be accepted, and the inflection is not to be looked upon as due to one great smoke-cloud hovering over the murky "province" of houses, and appearing in one district or another as the winds compel it, but never positively leaving us altogether, even for a single day. In this particular, London has not improved of late years; it may, indeed, be said with much truth to have become very decidedly worse. Time was when the fogs, together with the odours from the river, the thunder of the countless vehicles over the paving-stones, and the blocks in the street traffic, were accepted as amongst the more striking characteristics of life in London which a casual visitor from the provinces would be most likely to retain in his memory. We have succeeded in mitigating the blocks of vehicles; wood and asphalt have replaced the granite cubes in our busiest thoroughfares, so that it is possible to hear oneself speak, even in Chapside; the river is now comparatively pure; but the fogs are worse than ever, because more frequent. To a certain extent, according to Dr. Alfred Carpenter, the character of the modern London fog is not exactly the same as that of the old pea-soup fog of our ancestors. That was, in its essence,

a true mist, resembling very fine rain, having its origin in the river or in the wet soil, and mixed with coal smoke; union in this case resulting in a strength of abomination not possessed by either ingredient separately. But on the occasion forcibly described by Dr. A. Carpenter, when he found himself enveloped in a dense fog in Hyde Park one Sunday morning lately, there was no mist at all either inside the radius affected or in the suburbs, the air being, on the contrary, beautifully clear everywhere else but at the West-end, and even in the thickest of the fog there was no moisture, the "pall" being therefore composed of smoke alone. The origin of the fog was rendered still plainer by the fact that it was distinctly flavoured with sulphurous acid, that and the unconsumed carbon itself being clearly derived from the countless household fires which were in use at the time, no factories being in action on the day in question to share the blame.

The discovery of the cause of a disease is in many cases merely a preliminary to its cure; but occasionally it serves to show the hopelessness of any quest for a speedy and radical remedy. We fear Dr. A. Carpenter's observations of the immediate cause of dry fogs belong to the latter and more unpromising class of social troubles. If this gentleman, with *The Times* at his back, had been able to announce that fogs came from the ovens where Sunday bakings were going on for all comers, or from the early Sunday excursion trains, or from the river craft, the case would have been different, and the unfortunate offenders would probably have cause to tremble before long; but the coal-fire of the English householder is an institution not to be touched without great caution, and it is to be feared that, in view of the increasing and intensifying character of the nuisance, the course of procedure recommended by Dr. A. Carpenter is not very practicable in most of its leading features. His proposals would apply, of course, to every smoky town of this coal-burning land, and cannot be considered to err on the side of temporizing or half-heartedness. Briefly, he would have a Government tax, so heavy as to be prohibitive, imposed upon all grades or fireplaces which do not consume their own smoke. The result would be an increased demand for gas fires and cooking stoves, in which event gas would have to be sold at from 2s. to 2s. 3d. per thousand cubic feet. Factory chimneys would, of course, be laid under heavy restrictions as to their emission of smoke, and all Railway Companies would have their locomotives similarly regulated. When all this is done—somewhere about the time of the Greek Kalends, perhaps—London skies will be no longer obscured with black fogs, and street mists will reappear in the white fleecy forms in which they may be seen in damp corners of pasture land, or at sea.

The gas interests should be intensely grateful to Dr. A. Carpenter for his advocacy of their staple commodity, and although he contemplates the transfer of the Metropolitan Gas Companies to a Central Authority, as a necessary preliminary to compulsory use of gas for all the purposes for which coal is now in favour, we may assure him that with such an immensely increased consumption as his proposition involves, the present organization would be found competent to distribute gas at a very much lower price than that at which it is now sold. But we are not very sanguine about ever seeing the old-established London fogs abolished, at least not by the heroic measures suggested by Dr. A. Carpenter. We retain too lively memories of the result of a famous proposal to lay a small tax on matches, defensible as that project was on many grounds, to hope for an impetus to gas consumption from a Government tax on a Briton's hearth, just because it may happen to smoke. As well attempt to tax the Briton himself for the same reason. These are considerations of general policy, or social science, as it may be called, which have certainly never occurred to the enthusiastic *avant*, who would impose a task on the Executive which would appal the strongest Prime Minister, and, if attempted, shatter the largest parliamentary majority ever brought together. It is strange how well-meaning theorizers will invoke the most despotic powers when a pet theory is to be supported, though in all other things perchance the most philosophic of Radicals. It is evident that the cause of gas for cooking and heating would be in a bad way if it had to depend solely on such high-handed propagandists as Dr. Carpenter. Fortunately it is otherwise. The use of gas in this manner is increasing on its own merits, and although the day may be far distant when any substantial diminution of the smoke-pall of London may be noticeable as due to the predominance of gas where coal now reigns, it is nevertheless a source of congratulation to those who are labouring quietly to bring about this desired revolution in the domestic arrangements of our town popula-

tion, that every kitchen fire replaced by a gas-stove is a gain, if but a small one, to the purity of the atmosphere, and the consequent health and happiness of their fellow-townsmen.

Mr. Edison is in print again with a statement of what he can do with his electric lamp, and as he has thought fit to append his own signature to the communication on the subject, which is published in the last number of the *North American Review*, some notice is due to the only account we have seen of this wonderful invention which bears the name of the renowned inventor himself. At the outset, we must caution too curious readers against indulging in the hope that their desire for exact and detailed information will be satisfied on the perusal of any more complete extract from the article in question than will be found in another column. The article is, in fact, nothing more than a series of assertions that Edison's system is, and always has been a success, unsupported by any evidence that the objections already raised to the "tinder-box" arrangement are either trivial or have been surmounted; although, from internal evidence, it would appear that Mr. Edison has seen cause to reconstruct his lamp in almost every detail. The practicability of the system is "going" to be demonstrated at Menlo Park before the end of the year, according to the article.

It is now two years since the announcement of Mr. Edison's success in dividing the electric current, and in adapting its previously unmanageable power to the humblest household requirements, created the now historic "scare" among holders of gas shares. Since then the timid owners of gas property have had ample time to recover confidence, and, notwithstanding, gas stock now stands as firm as it has ever done. Yet again we are bidden to tremble. The scooped-out tarnip is illuminated once more with the old ghostly tinder, and if another scare does not gratify the "bears" of the Stock Exchange, it will be due to the fact that the play is now too stale, the ghost has been seen by daylight, and his terrors have shrunk to nothing on close inspection. Mr. Edison has from the first allowed his fame to be traded upon and discounted by too many of his followers to receive the attention otherwise due to his present utterances. But while declining to examine his remarks in detail, because of their lack of novelty and force, we cannot omit to state, as our firm conviction on the whole matter, that if Mr. Edison's lamps, and the apparatus he has designed for use in connection with them, had been, as he contends, perfect from the first, he would never have delayed the practical demonstration of that fact, which the lighting of Menlo Park would have afforded, for a period of over two years. Yet this is precisely what he has confessed to having done; and, in fact, has not yet repaired, for that suburban neighbourhood, although lying at his own door, is not actually lighted even yet.

We do not join in the cheap ridicule of Mr. Edison, which his apparent folly in shouting before the fighting was over, or even commenced, has evoked in some quarters. We have never denied to him the possession of extraordinary talents, and still consider him one of the most versatile inventive geniuses of the age; but while we can readily admit that he may possibly succeed in making a very ingenious electric lamp, we have always denied that anything which he or any other electrician may be able to accomplish in this direction will have the destructive effect upon gas lighting anticipated by himself and his friends. And it is not very clear why Mr. Edison and others are so bent upon ruining gas proprietors. Are the people who own gas stock and earn their living by making and distributing gas such a tribe of malefactors that their extermination is a thing to be desired? If Mr. Edison would only aim at the perfection of his own work, and let gas lighting decline or flourish as fate decrees, we should have less cause for disagreeing with him. Although we recognize his genius, it is impossible to consider him consistent—a quality claimed for him by a young Transatlantic contemporary published in the interest of general science, which apparently worships at Mr. Edison's shrine, and in an early issue violently attacked the *JOURNAL* for daring to express disbelief in their idol's power of making good the rash predictions of his friends. There is not much consistency or even common prudence in keeping back the public proof of the utility of an invention of incalculable value, if workable, for two or three years; and when this is done we can only assume that something is wrong. In considering the failure as being due to the imperfections of the apparatus rather than to any departure from a straightforward line of action on the part of the inventor, we have, as we imagine, taken the most charitable view of the case.

The Town Council of Carlisle are in the somewhat pleasant difficulty of having a sum of money with which they do not exactly know what to do. It is scarcely necessary to explain that this disposable surplus is composed of the accumulated profits of the Corporation gas undertaking. The financial position of the undertaking is rather peculiar. Its capital value is put down at £60,476; but the amount to be set aside for the year's interest is only £704, the cost of the works having been almost extinguished. The accounts are kept in a curious form, but it appears that during the past year a profit of £5493 has been realized, and there is a balance in hand of £2212. There is an annual tribute of £2000 payable to the Corporation, but it is in respect of this appropriation that the present difficulty has arisen. It appears that when the gas undertaking first became the property of the town, grandiloquent prophecies were rife as to the public improvements which were to be made with the money of the gas consumers. But time has passed away, and although a considerable amount of cash has found its way from the gas department into the general funds of the Corporation, the absolute good which has been thereby effected is not very evident. "Lightly come, lightly gone," is about all that can be said in explanation. A market has been "tinkered," a constable's house built, and one or two other matters have been helped forward by this annual subsidy; but the great public benefits which it was to have conferred have not yet declared themselves to the expectant inhabitants of the borough. The only thing at all certain about the matter is, that although the gas consumers have been mulcted of several thousand pounds, nobody in particular has derived a corresponding advantage; and this conviction having been borne in upon the minds of the members of the Town Council, a Committee has been appointed to determine what shall be done with the money. We would suggest that the most satisfactory way of disposing of the sum which is now going begging would be to establish a reserve fund with it, whereby an element of security would be afforded to the consumers against accident to their property. For it must not be overlooked that if, as is generally granted, a thing belongs of right to him who pays for it, the Carlisle gas undertaking belongs, in a qualified sense, to the consumers. And then the next necessary step to be taken is to reduce the price of gas to the minimum required to pay expenses, and leave a slight margin to keep up the reserve to the proportions due to the extended business which would surely follow. The course of action we have indicated is the only one which can be relied upon to invariably act fairly to all parties, and prevent the possibility of dissatisfaction with the distribution of the plunder of the gas consumers. If the Corporation of Carlisle see fit to take our advice, they may expect with confidence to escape any further discussion as to their gas policy from the malcontents who are now clamouring to know how the money has gone. With respect to the remaining features of the gas accounts, the Engineer, Mr. J. Hopworth, must be congratulated on the saving he has effected in his leakage, for, with a total increased production of only about 150,000 cubic feet, he has sold $4\frac{1}{2}$ million cubic feet more gas than in the previous year, the percentage unaccounted for having fallen from 7.94 to 4.59. Beyond this there is nothing of special interest in the report or accounts.

The Belfast Corporation have done exceedingly well with their gas business since they acquired the undertaking from the late Company. We shall have occasion next week to examine last year's accounts more fully, but for the present must note the salient fact, in connection with the administration of the present Gas Committee, that it is proposed to transfer £50,000 now standing at the credit of the renewal and depreciation fund, and £22,500 from the profits of the past year, making together the sum of £82,500, to the credit of capital expenditure, and so reduce the premium paid to the Shareholders of the Gas Company on the acquisition of the works. This premium amounted to £186,550, and the Gas Committee propose to continue the yearly application of a portion of the surplus profits until it is extinguished, thus leaving the original capital at the same figure—£250,000—as it stood in the Company's books. There can be no objection to this procedure, as it is only a special application of the principle of a sinking-fund, which might, in fact, be extended to the entire original capitalized cost of the undertaking. We are not altogether so sure, however, that the spasmodic diversion of large sums for a few years is quite the most convenient way in which the desired redemption can be carried out. We should have preferred to have seen a definite plan laid down for the extinction of the premium in a stated time. The proposal to hand large sums of money,

such as £82,500, from one account to another is somewhat too Napoleonic to be pleasant. Disposable amounts of this calibre are also apt to excite the cupidity of outsiders, who may be induced to believe that what can be done by a mere resolution proposed by one member of the Council, may also be done by a motion, with a different object, proposed by another ratepayers' representative. On the present occasion, a plea was raised for some £32,500 of the amount in question for building a covered market. The request was not entertained, but it may be preferred with more success at a future time. Not, perhaps, while Sir John Savage retains the reins of the department; but this veteran administrator cannot be expected to be kept at his post for ever. It is fortunate for Belfast that Sir John's intention of retiring was modified by the general desire of his colleagues into retention of office, with an efficient Deputy-Chairman for routine work. Sir John Savage is identified too closely with the borough to be allowed to retire from all control of its affairs, so long as his energies, although probably wearied, remain essentially unimpaired.

The Bedford Corporation have made up their minds to terminate their squabble with the Gas Company by purchasing the Company's undertaking, and as the Directors have no objection to part with the property if terms satisfactory to the Proprietors can be arranged, the transfer should not be attended with many incidental difficulties. It has been the custom from the earliest ages for the two parties to a bargain to differ widely as to the value of disposable property, and this principle must have been the motive actuating the Corporation in their late constant revilings of the Company. It may here be observed, however, that the price of a gas undertaking is not a thing to be substantially affected by any preliminary huckstering process, and it would have been more consonant with the dignity of the Municipal Authorities of Bedford, if they could have approached the subject in a graver and at the same time more conciliatory manner. Nothing tends so much as an inaugural quarrel to prolong and aggravate the possible disputes between vendors and purchasers in the course of protracted and sometimes difficult negotiations; and the difference in the costs of the proceedings when the parties are antagonistic, as compared with those of an amicable arrangement, should alone be sufficient, if no other reasons in favour of peace could be adduced, to cause the Corporation to drop their quarrelsome humour, now real business is in prospect, and, sinking all past differences, to meet the Company in a fair and straightforward manner, and so proceed to a settlement in the most direct and economical way possible.

Ill-advised and abortive parliamentary action by Local Boards against Gas Companies invariably leaves a most irritating effect in the inevitable bill of costs, which, moreover, comes before the public at an aggravating distance of time from the period when the fiery petitioners first commit themselves to the tender mercies of lawyers and parliamentary agents. Nothing is easier than to make (local) patriotic speeches, and to instruct the Clerk to oppose the Gas Company in Parliament; and when it is all over, nothing is more galling than to have to pay the said Clerk's "little bill," sometimes for nothing at all, and occasionally for the acquisition of concessions, imposing enough in Committee, but of small real value to the community twelve months afterwards. The Holywell Local Board considered themselves called upon to oppose the Provisional Order applied for by the British Gaslight Company last session, and, having failed ignobly, there is now great heartburning over the settlement. They also made application to the Local Government Board for an Order to sanction the establishment of competing works, and failed by being too late. The costs are only £160, but the fact of their having been incurred uselessly rendered the consideration of the bills included in the amount peculiarly irksome to the members of the Local Board. They may console themselves with the reflection that the least said about the affair the better, and it is to be hoped that, having bought their experience, they will be in no haste to employ their Clerk on similar business in the future.

At the meeting to be held on the 2nd prox., the Directors of the Imperial Continental Gas Association will, subject to the audit of the accounts, recommend a dividend of 5 per cent. for the half year ended June 30 last, and a bonus of 1 per cent., both free of income-tax.

SALE OF SHARES IN THE HANDSWORTH WOODHOUSE GAS COMPANY.—On Wednesday last, Mr. R. Ward offered for sale by auction three 45 shares, fully paid, in the above Company, and after a spirited competition they were knocked down for £7 2s. 6d. each. Twelve others were sold at £6 per share, and another lot of 12 at £5 15s. each.

Water and Sanitary Notes.

THE extraordinary magnitude of the supply furnished to London by the Water Companies is faintly appreciated by some people. The quantity last month, as shown by the official returns, was not far short of 152 million gallons per day, an increase over September, 1879, of more than 12 million gallons. In the same period of time there has been an increase of 26,694 houses—that is to say, one every twenty minutes. Facts of this description can scarcely have been present to the mind of a gentleman who writes to the Editor of the *Glasgow Herald*, making a novel suggestion for the extinction of the London Water Companies. This ingenious individual proposes that "a limited liability Company should be formed, for the purpose of conveying water by railway to London and other cities." The Caledonian line is specified as one which goes through a district "where choice water can be had." This being the case, it is stated that "a train freighted with pure water might be run daily to London, and this first necessary of health carted through the streets and retailed at a moderate price." Leaving out of sight the "other cities," we would call the attention of this gentleman to the number of trains that would be necessary in order to convey into London the volume of water now consumed by its inhabitants. The weight of the entire quantity last month averaged about 689,000 tons per day. If we reckon that only two-thirds of this quantity is required to be in a state of purity, the railway must bring to town some 460,000 tons per day, which, at 300 tons per train, would require a daily service of about 1500 trains. How many horses and carts would be necessary for the due distribution of the supply, we forbear to calculate, as also the "moderate price" which the consumer would have to pay for his usual quantum, averaging, for domestic purposes alone, some 25 gallons per head per day. On the whole, we are inclined to believe that the chief water supply which the railway trains will bring to London for some time to come will be that which is contained in the milk.

The Vestry of Camberwell some short time back addressed a letter to the Metropolitan Board of Works, asking that body to make some improvement in the existing arrangements for obtaining a supply of water at fires. At the last meeting of the Board, the Fire Brigade Committee reported, in respect to one of the suggestions made by the Vestry "as to the residences of the turncocks," that the Board had no power to make any arrangements for the purpose. Nevertheless, it is a fact that, years ago, the Water Companies expressed a desire for their turncocks to reside at the Fire Brigade stations, and offered to pay rent for the purpose. The Board declined this offer, as they have declined everything that could increase the efficiency of the present system, so far as the Water Companies are concerned. To all complaints from the public the Board have one unfailing reply—namely, that the Companies must be got rid of. That is the kind of answer now sent to the Camberwell Vestry. The Fire Brigade Committee reported to the Board, that with reference to the general subject of the supply of water at fires, it was unnecessary to remind them how frequently this had been under consideration. The Committee then went on to say that in the present state of the Metropolitan Water Question they were unable to see that the Board could take any action which would be productive of beneficial results. Proceeding on these accustomed lines, the Committee recommended that the Vestry be informed that the subject had not been lost sight of by the Board; that the Government, it was believed, proposed to submit to Parliament next Session a Bill to deal with the Water Supply of the Metropolis; and that the Board would further attend to the subject when the Bill appeared. This is the reply which is to be sent to the Vestry of Camberwell, and which fully accords with the time-honoured policy of the Board. How much property might have been saved from the ravages of fire, had the Board condescended to co-operate with the Water Companies, we will not attempt to estimate; but we may again warn the authorities at Spring Gardens that the Water Question is one on which they may meet with their own Nemesis.

The Balloon Society of Great Britain are about to undertake a variety of operations designed to promote the extinction of London fogs. We wish this great sanitary enterprise all possible success. Fogs are decidedly prejudicial to health, and in London they assume a magnitude and a density which are literally appalling. The Balloon Society propose in the first instance to find out what the actual London fog is made of, and where it comes from. Refusing to accept the dictum

of Dr. Alfred Carpenter on the subject, they are going to despatch a flying squadron of balloons in the midst of a fog, the Aéronaut in each balloon being commissioned to secure a bottle of the aerial mixture, which is forthwith to be "dropped to the earth and conveyed to a chemist for the purpose of analysis." Dr. Frankland, it is stated, will be engaged for the purpose of analyzing the samples of fog, thus affording that gentleman an altogether new sphere for the discovery of life-destroying germs and previous animal contamination. But this is not all. The "children of the mist" are to soar above the fog, which Mr. W. H. Le Fevre states to be only 300 feet thick, and are then to explore its upper surface. More interesting still, the Aéronauts are to bombard the fog by means of dynamite or other explosive compounds, for the purpose of seeing whether it is possible to make a breach in the fog-bank, and perhaps compel the enemy to retire. At the meeting where these schemes were discussed, Captain Pin remarked that the Trinity Brethren would be greatly interested in the dynamite experiments, if only they could get the upper hand of sea fogs. Mr. Le Fevre, who was in the chair, discreetly observed that sea fogs and land fogs were very different things. "At present," said the Chairman, "the Committee are confining themselves to the fogs of London." Captain Pin replied that he had found sea fogs ten miles from land, and he thought them quite as bad as London fogs. It having been stated that the Photographic Society were going to take part in the experiments, one gentleman—Mr. Henderson—said he "failed to see what part, so far as actual aid was concerned, photography could play in this matter." We confess that to ourselves also this part of the subject does not appear very clear. On the whole, the meeting sustained its enthusiasm, and the proceedings terminated with a very long resolution, moved by the Chairman and unanimously adopted. The first result of this enterprise will apparently be the conversion of a London fog into a species of thunderstorm, by means of discharges of dynamite, accompanied by a meteor shower of bottles containing vapour intended for analysis. We hope there will be no accident, and that somebody will be the wiser.

Floods have been raging in town and country. A memorial to Mr. Gladstone, from the Mayor, Aldermen, and Burgesses of the borough of St. Ives, in the county of Huntingdon, calls attention to the mischief and loss thus occasioned, and raises the general question of River Conservancy. The overflowing of the Ouse affects the neighbourhood of St. Ives, and no authority exists having power to provide a remedy. It is therefore asked that the Government will introduce a measure which shall enable the owners and occupiers of land and the inhabitants of towns in the watershed of the Ouse, to abate an evil under which they suffer, in common, as they believe, with most of the river valleys of the country. It is evident that the evil is growing in magnitude, and the aggregate loss must be very severe. A system of Conservancy Boards for the whole country seems to be urgently demanded. Even the valleys of Kent and Sussex are being visited with disastrous inundations, and complaints are rife in and about London as to the frequency and severity of the floods occasioned by overflowing watercourses. Last week *The Times* spoke of Lewisham as "a submerged village"—a phrase much stronger than the fact, but nevertheless indicative of a melancholy state of things, involving loss of property as well as peril to the public health. While the drainage of land is increasing, the capacity of the rivers seems to be diminishing, owing to the presence of weeds and the silting up of the beds.

THE Directors of the San Paulo Gas Company propose paying an interim dividend at the rate of 10 per cent. for the six months ending the 30th of June last. The total receipts for the half year were £11,718 8s. 3d., the net revenue being £435 10s. 10d. After deducting the amount of present dividend (£341 10s.), and writing off a further 20 per cent. of the balance of Main & Co.'s debt (£126 9s. 8d.), they carry forward £1723 9s. 4d.

TAVERSTOCK GAS COMPANY.—The annual general meeting of this Company was held on Monday, the 27th ult.—Mr. R. Dennis in the chair. The Directors reported that the gross rental for private lights for the year ending June 30, 1880, was £1659 17s. 9d., being a decrease on the amount of the former year of £164 8s. 9d.; and, after deducting the discounts allowed for prompt payment, amounting to £240 14s. 11d., the net rental would be £1419 2s. 10d. This decrease was mainly due to the reduction in the price of gas, which took place on the 1st of January, which made a difference in the gross rental of about £132. The Directors stated that, after making the usual estimates for alterations and conducting the affairs of the Company for the current year, the accounts would admit of a dividend of 12s. per share, and they therefore recommended that such dividend, amounting to £420, should be declared. The report and accounts were received and adopted. Mr. H. T. Doble and Mr. S. Nosworthy, the Directors who retired by rotation, were re-appointed. The Auditor, Manager, and Secretary were also re-elected. Mr. Greenfield proposed a vote of £10 10s. to the Directors, as an acknowledgment of their efforts on behalf of the Company. The motion was carried unanimously, and the proceedings closed.

LOCAL GOVERNMENT AND PUBLIC HEALTH.

LOCAL GOVERNMENT is not to be had without payment. Its outlay is ever increasing, and the ratepayer bears by far the greater portion of the charge. The Annual Report of the Local Government Board enlightens us on this subject, and the volume just issued tells us that during the financial year ending on March 25, 1879, the expenditure of the Urban Sanitary Authorities of England and Wales was £18,663,757, while that of the Rural Sanitary Authorities was £445,517. The receipts from current rates were respectively £7,562,684 and £200,802. The outstanding loans of the Urban Sanitary Authorities at the close of the year amounted to £56,591,080, and those of the Rural Authorities to £642,617. At the same date the aggregate value of the Urban Sanitary Districts was £49,753,326. During the last four years the annual receipts of the Urban Sanitary Authorities from current rates have increased 21·3 per cent., their annual expenses 58·7 per cent., and their outstanding loans 67·7 per cent. In the same period the rateable value of the districts governed by these Authorities increased 20·8 per cent. It is a notable fact that the outstanding loans of the Urban Authorities have increased during the year by as much as £10,407,052, or 22·5 per cent. In view of this unparalleled accession to the loan account, the ratepayer is encouraged by the consideration that, so far as the debt has been incurred in respect of "reproductive works, and especially of water and gas undertakings," it constitutes "an apparent rather than an actual increase in the burdens imposed on the ratepayers;" that is to say, "assuming that the works have been acquired or carried out at a reasonable cost, and that due provision is made for the liquidation of the loans within the period during which the works on which they have been expended will be of service to the successive generations of ratepayers, by whom they will have to be repaid." No doubt gas and water undertakings are valuable, and the extent to which the income from these properties is made to serve as a species of supplemental rate will be a matter for consideration during those "successive generations" to which the Local Government Board are looking forward.

Since the institution of the Board in 1871, that department has sanctioned loans to be raised by Urban and Rural Sanitary Authorities to the extent of £18,824,168. In 1872, the amount thus sanctioned during the year was £602,271, whereas in 1879 the yearly addition was £3,308,032. Since 1871, borrowing powers exercisable without the sanction of the Local Government Board have been conferred by Parliament on Sanitary Authorities to the extent of very nearly £27,000,000, exclusive of the unascertained amounts required for the purchase of twenty-four gas and water undertakings, a recreation ground, and the costs of promoting several local Acts. During the session of 1879, borrowing powers were granted by Parliament to the extent of £6,427,754, by far the greater part being required for the purposes of water supply. On this account the Corporation of Manchester alone took more than half the total. Birmingham took £489,000, Nottingham £900,000, and Cardiff £470,000, the total of the water loans being £5,284,000. The Corporations of Leicester, Nottingham, and Over Darwen obtained powers of borrowing for the generation and supply of the electric light. Similar powers, but exercisable subject to the sanction of the Local Government Board, were also obtained by the Corporation of Liverpool. The period allowed for the repayment of loans having reference to the electric light was limited in each case to ten years. In North Wales, where there has been great activity in effecting sanitary improvements, it appears that the amounts expended by the Authorities on water supply have been much less than they otherwise would have been, owing to the fact, as stated, "that in many instances, where a water-works scheme had been in contemplation by the Authorities, it was taken up and carried to completion by a private Water Company." In seven years, the Sanitary Authorities of North Wales have expended £182,754 on structural works, of which £152,910 has been devoted to sewerage works, and £23,290 to water supply. More than £50,000 has been expended by the Rural Sanitary Authorities alone, of whom it is observed that they belong to a class first called into existence by the Public Health Act of 1872.

That portion of the Annual Report which is appropriated to the Metropolitan Water Supply contains nothing particularly new, unless it be a statement by Dr. Frankland that the Southwark and Lambeth Companies delivered water which approached nearer to uniform clearness than that of any of the other river Companies. Only on one occasion, in 1879, did these two Companies deliver water so bad as to be even

"slightly turbid." In this respect the Southwark and Lambeth Companies occupied a position no worse than that of the Tottenham Local Board. We also find it recorded that only on one occasion did any London Company deliver water that was "turbid," and on no occasion was the water "very turbid." Taking the number of occasions when the water was "clear and transparent," the Southwark Company and the Lambeth have the highest figure of merit, the Chelsea and Grand Junction having the lowest. In the catalogue of "moving organisms," the Southwark and Lambeth Companies appear in conjunction with the New River as having none in their supply during the year 1879. In 1876 there were seven occasions on which the Southwark water exhibited these organisms, in 1877 the occasions were five, and in 1878 three. The change in the West Middlesex is rather remarkable. From 1869 down to 1877, both inclusive, the water supplied by this Company yielded no moving organisms, but in 1878 it did so on one occasion, and in 1879 on two occasions. In the last three years shown in the table, taking the whole of the Companies, moving organisms are reported on twenty-six occasions, whereas in the previous three years they were discovered on sixty-one occasions. The average of the whole eleven years is fourteen, and the number in the last three years was respectively eleven, eight, and seven. This would seem to indicate a progressive improvement. It is to be understood that these organisms are not found directly in the water, but in "the sediment deposited by turbid water on standing."

Some interesting passages occur in that part of the report which describes the operation of the Sale of Food and Drugs Act of 1875. More than seventeen thousand analyses were made during the year, of which about one-third were of milk. In respect to this article, adulteration has declined, as estimated by the proportion between the samples found to be adulterated and those that were pure. But the evil is still very much too prevalent. The quantity of milk brought into London by the Railway Companies now amounts to nearly 20 million gallons annually. On the basis of a moderate estimate, it is calculated that the total annual consumption of milk in London is nearly 23 million gallons. At fivepence a quart this corresponds to an expenditure not far short of two millions sterling. According to the reports of the analysts, it would seem that nearly a quarter of this milk is adulterated with about sixteen per cent. of added water. Hence it is reckoned that the inhabitants of London "are paying between £70,000 and £80,000 a year for water sold under the name of milk." The milk supply is therefore to some extent the water supply under another name, and commanding a rate of remuneration which Water Companies might view with envy, if only it were honest. Another evil referred to in the Report is, that persons who thus adulterate milk "are not likely to be very particular as to the quality of the water which they use for the purpose."

The sale of "butterine" in place of butter is apparently on the increase. This article, produced from beef fat, is also known as "bosh" and "oleomargarine." New York exports about six million pounds of this article annually, of which the greater part is shipped to Rotterdam, Hamburg, and Bremen, where it is mixed with milk and colouring agents to give it a resemblance to butter. It is then churned and converted into butterine, and re-shipped, chiefly to England. Opinions differ widely as to the quality of this article; but it is properly observed that whatever may be the merits of butterine, it ought not to be sold as butter. The percentage of adulterated samples of coffee continues high. Of course "mixtures" duly labelled are not considered adulterated, yet where the proportion is 90 per cent. chicory, and only 10 per cent. coffee, it seems a question whether this is a "mixture," properly so called. Sugar is mostly a genuine article. An adulterated sample of jam was reported to be extensively composed of seaweed. We might suggest that possibly there was a mistake in this case, the jam label being attached to a bottle of pickles. The use of poisonous colouring matter in confectionery appears now to be rare; but "cider cream," composed of strong vinegar and acetate of amy, has been found to create "an uncomfortable feeling" in the stomach. Sundry samples of "unfermented wine" have consisted of sugar, water, and tartaric acid, coloured and flavoured to suit the eye and the taste. The adulteration of beer appears to be steadily decreasing. Spirits suffer, like milk, from the admixture of water. Aërated waters are damaged by the presence of lead, and soda water has sometimes proved to be mere water charged with carbonic acid gas. Vinegar is frequently "infested with immense numbers of particularly active animalcules known as vinegar cels."

What effect these "cels" are likely to have on the human system is not intimated. Perhaps the most mischievous adulteration of all is that which relates to drugs, and here it would seem there is great room for improvement. Many other topics in the Report invite discussion, and perhaps we may return to it at another time.

THE GLASGOW EXHIBITION OF ARTIFICIAL LIGHTING APPARATUS.

THIRD NOTICE.

Electrical apparatus is shown by several exhibitors. At the time when our notes were taken, the electric lighting of one half of the hall, promised in the programme, was not in full operation, only one lamp, on Mackenzie's system (as manufactured by Messrs. Strode and Co., of London), being ready for use. Messrs. Strode and Co. were among the earliest adapters of gas lighting to large halls, theatres, &c., by their well-known sun ventilating burners, which are to be seen in use in large buildings all over the kingdom, and their appearance in Glasgow as makers of electric lighting apparatus is therefore the more remarkable. It must not, however, be inferred from this circumstance that the firm have any intention of abandoning the manufacture of gas-fittings, or even of sun burners, on the principle, or rather instinct, followed by rats in leaving a sinking ship. An example of Hickley's system of electric lamp construction is shown by Messrs. J. Orme and Co., of London, and the same firm show Hickley's telephones, and a set of educational electric apparatus, as patronized by the Science and Art Department, South Kensington. Messrs. D. and G. Graham, of Glasgow, have the most important stand in the hall for general electrical exhibits, chiefly consisting, however, of signals, call-bells, telegraph instruments, and batteries. They show too a perfectly successful loud-speaking telephone, samples of lightning conductors and rods, and an apparatus for lighting gas by electricity. Similar articles are also shown by Messrs. Anderson and Munro, of Glasgow. Messrs. Chance Bros. and Co., of Birmingham, show a beautifully made heliophotal lens, for use in connection with the electric light, and also several dioptric ship lights of new design, to burn mineral oil. It is needless to say that the opportunity of showing the Edison light afforded by this exhibition was not seized by that enterprising inventor, and therefore visitors were denied the pleasure of seeing that masterpiece of the genius of Menlo Park.

In the department of oil lamp lighting, Messrs. Jones and Willis, of London, show a number of their "Hesperus" triplex paraffin lamps, with which they carry on war against gas at the other end of the line from that attacked by most of the present class of electric lamps. The great success of the "duplex" mineral oil lamps has apparently incited Messrs. Jones and Willis to try whether an equal measure of public favour will be accorded to a lamp with three wicks arranged in a triangle. On this principle there is, of course, no limit to the number of geometrical equal-sided figures which may be formed by the flat wicks of an oil lamp, or for that matter, by the flat flames of gas fish-tail or bat's-wing burners. But herein we may insert an apt *ex bono*? Duplex burners give a great light, but of a character particularly trying to the eyes, and with an attendant evolution of very great heat. Now, is it worth while to intensify these latter disadvantages by the addition of more wicks, even for the purpose of obtaining a still more concentrated light? We do not think this question can be answered in the affirmative. There is nothing else worth comment in the class of oil lighting appliances, and the same may be said of the specimens of mineral oil cooking stoves shown. These oil lamps and stoves are, in fact, more conspicuous by the evidence of their presence conveyed by visitors' olfactory organs than in any other way. In this respect they may be said to advertise themselves most assiduously.

We must not omit to mention the highly interesting stand of Young's Paraffin Light and Mineral Oil Company, of Glasgow, where may be seen samples of the various products obtained when bituminous shale and Boghead mineral are treated for other purposes than for their yield of illuminating gas. The importance which this peculiarly Scottish industry has attained under Dr. Young's direction is very remarkable. The latest development of petroleum, in the form of jelly, and its subsequent saponification, form the staple of the exhibits of Messrs. W. and C. Scott and Co., and Mr. W. S. Somers, of Glasgow. The successful gelatinization of petroleum was a most important triumph of chemistry, and although of recent date, the derivatives of the process are already very numerous. Vaselline, chrisma, petrolina, pomeline, and many more names, have been given to the ointments made from partially solidified petroleum, and the soap made from the same base is equally deserving of the favourable reception which has been already accorded by the members of the medical profession as well as by the general public to these elegant preparations.

Water-works apparatus and fittings also find a place in the hall, and although not shown in great numbers, deserve attention.

Messrs. J. Tylor and Sons, of London, show some water-meters and a few specimens of their waste-preventing appliances. The Glenfield Iron Company, Limited, of Kilmarnock, have a stand of water-works fittings, comprising valves, hydrants, cocks, and their accompanying road fittings; all strongly made and useful articles, not got up for show, but for heavy wear. The same manufacturers also show some flushing-valves, man-hole covers, sewer ventilating grates, and other sewerage fittings of similar character. Kennedy's Patent Water-Meter Company, of Kilmarnock, exhibit one of their specialties, with a glass cylinder, showing the action of the meter, which is extensively used throughout the kingdom. The Manchester

Water-Meter Company, Limited, show several of their meters, part in action; and Mr. David Johnston, of Glasgow, shows his positive water-meter, constructed in the form of parallel cylinders, the same principle being applied by him in the water-engine shown, by which organ bellows may be blown without the use of intervening gearing. Water-power engines are also shown by the Tuck Patent Hydraulic Motor Company, of Glasgow; these engines are remarkably neat, of small compass, and have a direct rotary motion. Messrs. A. Barr and Co., of Glasgow, show three of their double cylinder water-engines, which are about as simple appliances for developing power from water pressure as could be devised. The Waste-Water Meter Company, Limited, of Liverpool, show one of Deacon's waste-water meters in action, the water supply to the exhibition hall being passed through it. These admirable appliances for detecting waste are of such proved utility that recommendation of them in these columns would be needless. The power of determining the total volume of water supplied, used, and wasted, in districts provided with these meters, is naturally of the highest importance to those responsible for the control of the water supply of towns, and it is therefore easily to be understood that Mr. Deacon's invention is highly prized wherever its merits are known. One of Mr. Deacon's water-pressure reducing valves is also shown by Messrs. Gilbert Bogle and Co., of Glasgow. Another example of the reducing valve, the object of which is to check the pressure of water in the main to that required for ordinary consumption, is the invention of Mr. Foulis, of the Glasgow Corporation Gas-Works, exhibited by Messrs. Alley and Macellain, of Glasgow. The principle of the valve is substantially the same as that of a bye-pass gas-governor, modified to meet the requirements of the purpose for which it is intended, and it is susceptible of various special arrangements. It is of simple construction, and occupies very little space. The same firm also show some serviceable gas and water valves.

There are several stands of internal house-fittings, having reference to water supply and sewerage. Mr. W. Ross, of Glasgow, has on view a Bramah water-closet and cistern, fitted with water-waste preventer and after-flush arrangement. Mr. R. Meldrum, of Edinburgh, shows various designs of traps, sinks, wash-basins, &c.; as do Messrs. J. and M. Craig, of Glasgow, who are makers of a peculiar kind of stoneware for baths, troughs, and pipes. Messrs. Robert Boyle and Son, of Glasgow and London, show in the annexe a number of their revolving ventilating cowls, for rooms and soil-pipes, the contemplation of which is strongly provocative of vertigo. The British Sanitary Company, of Glasgow, have a stand whereon is displayed the so-called "Perfect Purifier" of Mr. Joyce, now so freely advertised. This material is a product of coal tar. More ventilators for drains and dwelling-houses are shown by Mr. W. P. Buchan, of Glasgow, together with yet another pattern for a water-closet.

Next to the provision of efficient means for the production of fire and light, is the necessity for effectual power of controlling and extinguishing conflagrations, which are the results of a useful slave becoming a particularly bad master. Consequently, in addition to the ample supply of water at hand in case of such an untoward catastrophe, there are several kinds of portable chemical extinguishers shown in the hall, serving at once as exhibits and useful aids in a possible emergency.

There are several stands of exhibits besides those named, such as are invariably to be seen at exhibitions of all kinds wherever held, without any particular reference to the special objects contemplated in the arrangements. These we are not at all concerned with, our purpose in these cursory notes being to give those of our readers who may be unable to visit Glasgow, an idea of the extent and character of the very admirable exhibition which the Executive Committee and their indefatigable Secretary (Mr. Mann) have succeeded in organizing. Enough has now been said, as we would hope, to show that, spite of certain gaps and interruptions in the order of subjects for illustration as originally projected, the articles shown, besides being generally of a high class and worthy of careful inspection on their own account, form a fair epitome of the materials and appliances in use at the present day—chiefly, indeed, for the purposes of giving artificial illumination, for warming, and for the general service of the kitchen and household, but also to some extent for other very varied necessities of an urban population.

EAST LONDON WATER-WORKS COMPANY.—The ordinary half-yearly assembly of the Proprietors of this Company was held at the Offices, 16, St. Helen's Place, E.C., on Thursday, the 7th inst.—Mr. J. Coops Davis in the chair. The report of the Directors, which was adopted, stated that the revenue from water rates during the half year ending June, amounted to £106,112 5s. 1d., or an increase of £8908 11s. 2d. over the corresponding period of 1879. The ordinary expenditure had been £42,913 16s. 9d., showing a decrease of £1312 15s. 5d. The revenue account had been temporarily affected by exceptional charges—viz., the balance of the cost of re-constructing certain filter-beds, £252 11s. 3d., and the transfer to this account from capital of a large portion of the amount paid to the New River Company for re-adjustment of the boundary line between the two Companies, amounting to £1556. The expenditure on capital account amounted to £26,405 0s. 7d. The excess beyond the amount of capital authorized was £20,227 4s. 6d. The water pumped during the half year was 5,907,628,576 gallons, being an increase of 373 millions of gallons; while 2744 additional supplies had been laid on, and applications continued to be very numerous. The new Albert Docks and district of Silvertown were, the Directors said, making great demands upon the Company, to meet which a new main, crossing the Barking Road, Bridge—for which purpose special provision would be required—had been laid, the estimated cost being £12,000. The Essex district was also rapidly increasing, large estates being laid out there. As the expenditure for capital purposes had exceeded the amount authorized by Parliament, the large demands for additional supplies required to be met by new mains, applications must, it was announced, be made to Parliament in the ensuing session for power to raise additional capital. A dividend at the rate of 64 per cent. was declared.

Notes.

[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

THE LIVESY-SOMERVILLE GENERATOR FURNACE.

Generator furnaces of an improved and thoroughly satisfactory type are now in use at the Old Kent Road station of the South Metropolitan Gas Company, where several through settings, having been refitted for generator firing, have been recently lit up for the winter. As we intend shortly to give a detailed description, with drawings, of the Livesy-Somerville generator furnace in its latest perfected form, it will suffice for the present to describe it briefly and generally. As constructed in a stage retort-house, not designed with special reference to generator firing, the settings of sevens previously used are retained, and nothing in the appearance of the retort-beds, as seen from the charging-floor, would indicate that they are heated in any unusual manner. The generator is in the place of the old furnace, self-contained in the setting, instead of being built apart, as is the general practice of the German engineers. The extra depth needed to make an ordinary open furnace into a carbonic oxide generator is, in the present case, easily obtained. The air necessary for the first act of combustion is admitted by a single slit in the bottom of the generator, through the crown of the arch which supports the bench; access to the slits from below being thus particularly easy. The slit is formed in the arch by a cast-iron curb. Steam is admitted with the air, by the slit, from a perforated pipe just beneath the cast-iron curb, ranged sufficiently on one side to be out of the way of the falling ashes. The air for the second, or final combustion of the carbonic oxide and hydrogen formed by the action of the first supply of air and steam to the deep layer of coke in the generator, enters by two openings in the crown of the lower arch, one on each side of the slit. These holes communicate with cast-iron pipes of rectangular section, built into the brickwork of the setting, and terminating in openings in the brickwork of the generator just above the maximum height of the fuel. The secondary supply of air is consequently heated, before it enters the generator and meets the carbonic oxide, by heat conducted by the walls of the generator, and from the lowest flues of the setting. The double combustion goes on with perfect order from the first regulation of the air and steam inlets. No clinker is formed, only ashes and loose friable rubbish being dropped from the slit, which seldom needs attention. The steam required is provided by boilers heated by the waste heat from the main flue of the retort-stack, and therefore does not cost anything for fuel or stoking. The appearance of the generator inside, when the firing-door is open, is that of a rather dull-burning furnace, filled, above the fuel, with pale yellow flame. The retorts can practically be maintained at any required heat, the power of the generator being capable of regulation to the greatest nicety; but sensational heats and heavy charges worked off in quick time are not in favour at the Old Kent Road. There is, however, no difficulty experienced in obtaining, in an ordinary way, a production of over 9000 cubic feet of gas per mouthpiece in 24 hours, with an expenditure of fuel equal to about 16 per cent., by weight, of the coal carbonized. By the peculiar situation and construction of these generators, they can be built at a very trifling excess of cost, per retort, over settings fired in the usual way.

DIETERICH'S REGENERATIVE FURNACES.

Our American correspondent, writing under date of the 30th ult., says: "When they have had an opportunity at Baltimore to test their new Dieterich's furnaces, I hope to give you the results thereof. The furnace put in at a small works in Connecticut, to which I referred in one of my published letters (see ante, p. 346), is doing well, giving 8400 cubic feet of gas per mouthpiece, and the bench, which is one of 5 retorts, is not worked to its full capacity. The furnaces are being introduced in several other Eastern cities, but are not yet under fire."

A GASHOLDER WITHOUT TRUSSING OR SCAFFOLDING.

The superfluous character of any form of trussing for the crowns of gasholders is made plain in a very striking manner by a spectacle at present visible at the Greenwich station of the South Metropolitan Gas Company. A holder, 140 feet in diameter, in course of repair, had to be hoisted up out of the tank. The holder being untrussed—a wooden scaffolding fixed in the tank serving to support the dome sheeting when all the gas is out of it—the usual course would have been to have cut the crown out, and, leaving it on its supports, to have subsequently pulled up the sides with screws. Instead of this laborious operation, it was decided to blow the holder up in the usual way to the required height, seize the bottom curb with suitable tackle, and then open the blow-off cock in the summit of the crown, and let the sheeting hang loose. The result answered every expectation. The dome began to sink from the centre as the gas escaped, and finally, without shaking or buckling more than when settling on its proper supports, it assumed a wavy shape, the centre being depressed somewhat below the line of the top curb, but the outer sheets retaining their rise. In this state it now remains, the crown is not in the least damaged, and there is no reason to suppose that any difficulty will be experienced in restoring the dome to its pristine shape when the internal pressure of gas is again applied. From this example, on by no means a small scale, it would appear that, except for the convenience of construction in the first place, even a fixed staging in the tank is not really essential

for the safety of the crown of a gasholder. The matter would be slightly complicated by the presence of the water surface at a higher level than the point at which the centre of the dome would hang at rest, if the crown were cupped while the holder remained in its place in the tank; but if there were a liability to buckles from this cause, as is very probable, it might be prevented by letting the water rise up and cover the crown. It is needless to point out that a large dome would be less liable than a small one to damage from any such process of inversion as that above described, as, in consequence of the length of the arc of its section, the angles of the wavy ridges mentioned would be less severe.

THE USE OF GAS FOR LIGHTHOUSES.

Recently issued parliamentary papers on the subject of the Copeland Island light, situated at an important turning-point of Belfast Lough, give a graphic account of the endeavours made by the Commissioners of Irish Lights, in the face of the opposition of the Board of Trade, to procure the Board's sanction for their proposal to adopt gas instead of oil as a means of illuminating that station. The case for gas was further prejudiced by the adverse opinions held by Mr. Douglass and Captain Cole, the professional advisers of the Commissioners, whose official comparative estimate of cost for establishing and working gas and oil lamps at the station in question was made to show strongly in favour of the latter. This was, however, leaving out of sight the great difference in power of the two lights, for whereas no oil lighthouse lamp that has ever been constructed gives a light of more than 722 candles, the Wigham trifurc gas-burners, with 108 jets, possess a possible illuminating power equal to nearly 12,000 candles, at a cost of 1s. per candle per annum on the usual computation of the hours of lighthouse illumination, as compared with 4s. 8d., the ascertained cost of one candle power derived from paraffin. This method of computation apparently opened the eyes of the Central Authorities, and after much red tape had been wasted on both sides, the Irish Commissioners carried their point, and the lighthouse is to be fitted up with one of the most powerful burners Mr. Wigham can devise, adjustable to various fog powers, with a fog "siren" accompaniment. The testimony to the value of gas as a fog-penetrating agent, offered by many masters of the Channel mail-boats, and other experienced seamen, is most convincing. According to these practised observers, when a fog is so thick that no oil lamp can be seen, and a gaslight itself is invisible, the glow with which it pervades the fog is so unmistakable that there is never any difficulty in ascertaining the bearings of a lighthouse so illuminated. This statement is supported by Professor Tyndall, the scientific adviser to the Board of Trade, who strenuously supported the recommendation of the Commissioners. It is instructive to note that the Board of Trade, in the course of their correspondence with the Irish Commissioners, practically placed the electric light out of the question, on the ground that the attendant expense was so heavy as to exclude its application beyond the three stations at which it is at present in operation.

ADVERTISING BY ILLUMINATIONS.

At the establishment of a well-known firm of merchant tailors, &c., at the corner of the Minories, a brilliant and successful example of this method of advertising may be witnessed any night between the hours of six and eight o'clock, and on Saturdays until ten. Messrs. J. Defries and Sons, of Houndsditch, were commissioned to illuminate the exterior of a large and handsome block of buildings in Aldgate and Minories, and the result of their labours has been eminently successful. An outside service of gas, laid on from the main, surrounds the whole of the windows, and extends along the length of both frieze and parapet. Ten thousand gas-jets, in various coloured globes, outline the building; and in the centre, immediately in front of the large window, is an amber star of great size depending from a graceful scroll of variegated colour. By an ingenious arrangement the whole of the jets are lighted up at once, and the effect produced by the sudden starting of the vast building from darkness into brilliant outline is novel and striking, and adds another to the many successes already scored by the above-named firm in the way of artistic illumination. It is well worth while to see the display, either as an excellent specimen of the illuminator's art, or as an illustration of what can be done by an enterprising firm now-a-days in the way of advertising.

THE WATER SUPPLY OF HAYWARD'S HEATH.—It may be remembered that on the 21st ult. a special meeting of the Hayward's Heath Local Board was held for the purpose of taking into consideration the question of joining with Cuckfield and neighbouring places in providing a better water supply for the district. Two of the places suggested having refused to take any steps in the matter, a public meeting was held on Monday last week, at the Corn Exchange, Hayward's Heath, to consider the advisability of establishing water-works for this district alone; but after some conversation the proposition was rejected by a large majority.

THE PUBLIC LIGHTING OF WALTHAM ABBEY.—A public meeting was recently held at Waltham Abbey "to discuss the advisability both of lighting the town with oil as a substitute for gas, and also to request the Local Board to take into consideration at their next meeting the necessity of constructing gas-works for the district;" the Board, at their last meeting, having by a majority of one refused to accept the tender of the Gas Company for lighting the public lamps during the whole of the night, for eight months, at £3 13s. 6d. per lamp, in consequence of which the town had remained in darkness. Mr. Speller, who occupied the chair, compared the price proposed to be charged by the Company with those paid at Walthamstow, Romford, and other places in the locality, and urged the meeting to send a memorial to the Board, asking them to take steps to alter the existing condition of affairs. He had no hesitation in saying that they would save something like £40 in the first year, and have more lights, if they adopted oil. Mr. Tait moved—"That the town from this time be lighted with paraffin." Mr. Williams seconded the motion, and it was put and carried.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

MR. G. LIVESEY ON THE ECONOMY OF CARBONIZATION.

SIR,—The article communicated by Mr. George Livesey, in your issue of this week, on high yields of gas per ton of coal carbonized, opens up a question which has repeatedly been raised, and as often shelved without any definite result being arrived at, which should determine once for all within what limits high heats in the retorts, and consequent large production of gas per ton, may, with economy, be adopted.

Perhaps a large quantity of gas per ton has, in some cases, been produced simply for the purpose of gaining credit on that ground alone, and "vaunted" without consideration of ulterior effects. In other cases where comparisons have been made, the fact of increased production has been stated without the reason being given why this principle has been followed. I must confess, for my part, that I have not been altogether free from blame in this latter respect. There should be a reason for everything, and the engineer who goes in for a high yield of gas should do so only from a line of reasoning which convinces him that high heats will ultimately increase the revenue and promote the welfare of the undertaking he manages.

The question of high heats is, however, not one of increased production alone. It is far more one of *quick* production. The principle I have always relied upon is that rapid carbonization evolves more light-giving constituents from the coal than slow distillation. Rapid carbonization is to be obtained by high heats and light charges of short duration.

Mr. Livesey thinks, from the investigations of Mr. Leicester Greville, that high heats have but little effect in transferring the light naphthas from the tar to the gas. It appears to me that this is an incorrect way of stating the process. The heat applied in the carbonization of the coal can hardly be said to *transfer* light-giving constituents from the tar to the gas, inasmuch as the tar is not formed until the gas has left the retort. If, however, as I believe, a high heat converts more hydrocarbon into gas, and less into that thick vapour which is rapidly deposited as tar, may it not be the case that the case that, where high heats are in use, the condensing arrangements are such as to effect an absorption of the light naphthas, or other hydrocarbon vapours, from the gas into the tar at a later stage in the process of manufacture? It is readily conceivable that the form and extent of the condensing apparatus determines the quantity of hydrocarbon vapours which can be retained in the gas. The proportion would be subject to slight variations from the difference of atmospheric temperature and the quantity of gas being manufactured at any given period, but the condensing apparatus will place a limit to the proportion of light naphthas retainable in the gas, generally below the absolute and possible limit attainable with an absolutely perfect condenser. Besides, it is not only a question of retaining the more volatile hydrocarbon vapours. At a meeting of the Southern District Association of Gas Engineers and Managers, I suggested that the lighter hydrocarbons had the property of retaining by affinity the heavier ones, such as naphthalene. Mr. Greville has also propounded the same theory, in support of which he refers to the great increase in the illuminating power produced by using Aitken and Young's analyzer—an increase which cannot be due alone to the retention of the light naphthas.

There is, to my mind, no question that the total light-giving value of the gas produced from a ton of coal at a high heat is greater than when the coal is distilled at a lower temperature. I have repeatedly and continually proved this in regular working. When I took the management of these works, the make of gas averaged 10,000 to 10,200 feet per ton. It had been previously much less than this, but neither then nor later did the illuminating power average more than about 15 candles, according to the records kept. During the last four years the average make per ton has been quite 500 feet more, but the illuminating power has not been lower. To-day the make is 10,588 cubic feet per ton, and the illuminating power 15.96 candles, while the usual average is 15 to 15.5 candles. The coal is from the same pit as that which has been carbonized here, with little exception, since the commencement of the Company's operations, and no cannel has ever been used. It is true that the fuel account has been somewhat in excess of the quantity formerly used, but 10 per cent. is a very excessive amount with which to debit the production of 500 feet more gas. Three per cent. has sufficed to make the difference in my case, though something must be allowed for improved retort-settings.

Then, again, Mr. Livesey reckons 1 gallon of tar less for the extra 500 feet of gas. Has he really found by practical experiment that 500 feet more gas means 1 gallon of tar less? The Commercial Gas Company's accounts, published in last week's JOURNAL, show 10.9 gallons of tar produced per ton of coal carbonized, and the accounts for the 30th of last month show 11.4 gallons. In the former case the make of gas averaged 10,400 feet, and in the latter case 10,850 feet; so I do not think there is much lost by a diminution in the production of tar.

Wherever the maintenance of high heats in the retorts is desired, it should be sought to be obtained by improvement in the method of heating and the construction of the retort-settings, and not by "hard firing." In this direction Mr. Livesey is himself working, and though not aiming at the attainment of high heats, he will find eventually that his efforts in this direction will have the effect of promoting the adoption of increased temperature in the retorts. So long as high heats can only be obtained by employing a tearing draught in the furnace and a greatly increased expenditure of fuel, there will remain much reason in the arguments of those opposed to the use of high heats; but with the introduction of the regenerative system of heating, these objections will cease to have force. Already, with the improved furnaces at work in this country, although the regeneration is by no means so perfectly carried out as it might be, retorts are made to produce 20 per cent. more gas in the 24 hours without any increased expenditure in fuel, and at one works the Manager has been able to report to his directors that 900 chaldrons of blue coke were available for sale last quarter than in the corresponding period of the previous year, although 120 tons less coal had been carbonized.

Mr. Livesey will be doing good service by carrying out the experiments he proposes. At present he appears to have somewhat prejudiced the question. Not desiring, for the sake of economy, to use canal, he is obliged to reduce his make to keep up the illuminating power. If Mr. Livesey would try raising the heats and shortening his charges, I think he would find he could produce 16-candle gas with the use of fewer retorts, and with a somewhat increased production of gas per ton of coal carbonized.

Gas-Works, Peterborough, Oct. 13, 1880. G. ERNEST STEVENSON.

SIR,—Mr. Livesey has brought into prominence a subject that is most deserving of discussion, and his letter affords another illustration of the uncertain character of the traditions which not unfrequently govern gas management.

That "dividends are made in the retort-house" is probably the most fixed and cherished belief of the manager. Perhaps that was why I fell out with it years ago, for one by one I had found these traditions false, and at length regarded them all much as Sir Peter Teazle, after much experience, did "the routinists."

Agreeing, as I do, with the case against a high yield of gas per ton, as put forward by Mr. Livesey, I think there are some most important points not touched upon by him, and I shall be glad if you will afford me space briefly to lay them before your readers.

In the first place I would remark that, beguiled with the "honourable trifles" of excelling in the retort-house, the manager becomes very liable, in order to maintain a supremacy upon which he may pride himself, to ignore more or less the true market value of coals, and to choose only such material as will assist in keeping up his reputation as a gas-maker. Thus he may limit his selection to screened qualities, to the exclusion of the unscreened, nuts, or slack, or he may go farther still, and confine his business to a particular locality or colliery.

The evil consequence of such procedure is immense. Competition is minimized, and all the advantages that accrue therefrom are lost to the Company. Any one who has opened wide the door to all competitors will agree with me that the difference between the two systems of purchasing cannot be less than the value of from 1000 to 3000 feet of gas per ton. Of course, the previous high yield will not be realized, but the lower cost of coal will more than compensate for the deficiency.

But, after all, the loss may be more imaginary than real. If a coal gives much coke, I should say there is prospective evidence of inferiority for gas-making; for, that residual apart, it matters little, at present prices, whether the products are sold as gas, or tar, or ammonia. Weight for weight, tar is more valuable than gas, and ammonia should produce, in many localities, as large a return as tar.

These considerations, as Mr. Livesey has pointed out, should detract much from the value of statistical information, which, generally accepted as proving much, is worth in most instances extremely little. I can quite conceive, however, that stupid people who see no farther than their noses, may say, on taking up this aspect of the case, that so long as coal is thrown into a retort there is no use for the manager. The fact is far otherwise. Markets are always varying, and a policy that is good to-day may be bad a year hence. The management should, therefore, be intelligent to perceive, and sufficiently untrammelled and facile to vary with a dozen eventualities. Such analytical and commercial exercise, I venture to say, will prove more profitable to all concerned than that of everlastingly singing one's pate over the furnaces; and overweening faith in the retort-house once broken in upon, it will soon become apparent how comparatively little high heats have to do with dividends.

Leeds, Oct. 16, 1880. HENRY WOODALL.

SIR,—The question put by Mr. Livesey, in your issue of the 12th inst., as to the high yield of gas per ton of coal, being an infallible test of good management can but receive one answer in the form which it takes.

A high yield of gas may be, and, in my view, is a fair rough-and-ready test of good management; but certainly is not an infallible one, nor any criterion whatever where, as in London, we have to pay such extravagant prices for canal to make up the illuminating power, which the dilution of the extra quantity of gas made brings considerably below the standard to which we have to work on a system of daily and rigid testing by public authorities. The effect of this cost is shown in my own experience, where the use of 6½ per cent. of canal raises the cost per ton of coal to 7s. 7d. all round. The "Analysis of the Metropolitan Gas Companies' Accounts" supplies the answer in this case in the shape of Mr. Livesey's own unrivalled economy of production. It may become a question of "buying gold too dear."

Nevertheless, in cases where the illuminating power required is within the product of black coal worked alone, there are very many points to be urged in favour of using this criterion as a rough test of general good working. It speaks for the condition of the carbonizing plant, for its efficiency, and for its careful management.

I have been pleased to notice from various parts of the country very largely increased returns per ton of coal (nearly 11,000 cubic feet) in cases where the illuminating power is not impeded; and while I think we are, many of us, too much the slaves of fixed ideas on these matters, and that extra production must be dismissed as an infallible rule of guidance, these results are nevertheless very valuable and instructive. Did leisure permit, I think I could show a good many excellent grounds for not altogether slighting this standard of estimation.

How prone one is to attach religiously to a fixed idea, without sufficiently investigating it, is, to my mind, illustrated at the present time by the general confusion prevailing, whereby the results of good retort plant, well devised and manipulated, are being attributed to the mechanical appliances by which the coal is merely fed into the retorts.

London, E., Oct. 18, 1880.

H. E. JONES.

THE DISTILLATION OF COAL TAR.

SIR,—As my introduction of Messrs. Trewhy and Fenner's patent to your readers, in the JOURNAL for the 5th inst., was anonymous, I shall

feel much obliged if you will publish this letter from me—to save the patentees from being suspected of puffing their own invention, and to explain to Mr. Ford that at the end of the specification (which was not sent to save space) the patentees acknowledge that something of the sort had before been tried. Of the results we know nothing; but one thing is certain: The advantages must have been small compared with those known to accrue from the use of the process now under consideration, or Mr. Ford would not have wondered why any one in these days should be "at the trouble and expense of patenting a process" proved to be good and practicable "upwards of 30 years ago." Would it not be with us still?

W. MANS.

Oct. 18, 1880.

MESSES. H. and C. DAVIS and Co., of Camberwell, write to say they are not the firm referred to in the letter from Messrs. Stark and Co., published in the JOURNAL of the 5th inst.

MR. J. O. N. RUTTER, of Brighton, has written to call our attention to the prevalence of defects in vision, arising from disease of the optic nerve, which are beyond the power of spectacles to cure, and when present in a mitigated form may account for some of the continual complaints of the low illuminating power of gas indulged in so freely by many people. Arguing from the recently-revealed frequency of colour-blindness, at one time regarded as a rare visual affection, Mr. Rutter is of opinion that insensitiveness to light may be more common than is generally suspected. This may be so, but however consoling it might be to a gas producer to believe that the optic nerves of a discontented consumer were deranged, the discontent will remain a fact, whatever its cause, and the malcontent would probably resent any imputation on his own powers of vision as a personal insult. So that unless a gas consumer is commonly known to be partially blind, his word, in the shape of indignant letters to the local newspapers, will generally be found to carry weight when the quality of gas is in question; whereas, according to Mr. Rutter's theory, he may in reality be fitter for the position of an oculist than of an optician, or of an authority on visual photometry.—Ed. J. G. L.

Legal Intelligence.

PONTPOOL POLICE COURT.—SATURDAY, OCT. 9.

(Before Mr. E. J. PHILLIPS and Col. BYRDE.)

ALLOWING WASTE OF WATER THROUGH A CLOSET.

Mr. Henry Wittich, of Broad Street, Blenheim, was summoned, at the instance of the Blenheim Gas and Waterworks, under the 174th section of the Water-Works Clauses Act, 1853, for having caused a wilful waste of water belonging to the Company.

It appeared from the statement of Counsel, borne out by the subsequent evidence adduced, that on the 28th of last month, the Manager of the Company (Mr. C. White) went about midday to defendant's shop, for the purpose of inspecting the gas-meter. Just before leaving, he heard the sound of water rushing through the service-pipe leading to the water-closet. He asked to see Mr. or Mrs. Wittich, but neither of them was in, and, telling the servant what he was about to do, he went upstairs to the closet, and there found that the handle was propped up with a brass staff-rod, and that the water was running to waste to the extent, as he subsequently ascertained, of 200 gallons an hour.

Defendant did not deny wasting the water, but said that he let it run through the closet by order of his medical attendant; and if he had not carried out his instructions he would probably have been liable for breach of the sanitary regulations. He was in a very awkward position between the requirements of his medical man and the regulations of the Company.

Mr. PHILLIPS said defendant's medical man ought to have known better than to have told him to do a thing which was illegal, and fined him 10s., including costs.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following table in reference to the water supply in London during September. According to returns furnished to him by the Metropolitan Water Companies, 151,741,660 gallons, or 689,445 cubic metres of water (equal to about as many tons by measure, tons by weight), were supplied daily, or 255 gallons (115·9 decalitres), rather more than a ton by weight, to each house, and 35·9 gallons (16·3 decalitres) to each person, against 84·5 gallons during September, 1879.

COMPANIES.	Numbers of Houses, &c., supplied in		Ave. Daily Supply of Water in Gallons during	
	Sept., 1879.	Sept., 1880.	Sept., 1879.	Sept., 1880.
Total supply	568,357	395,352	159,492,637	151,741,660
From Thames	272,442	235,179	70,636,741	75,890,954
„ Lea and other Sources	296,915	160,173	68,855,893	75,850,706
THAMES.				
Chelsea	29,700	30,071	8,733,190	9,060,360
West Middlesex	53,062	55,449	16,024,635	11,385,470
Southwark and Vauxhall	57,421	49,629	24,947,301	24,847,264
Grand Junction	39,618	42,671	12,120,355	18,169,769
Lambeth	62,211	65,289	14,211,300	17,289,900
LEA AND OTHER SOURCES.				
New River	128,337	131,093	25,612,606	30,165,060
East London	128,249	128,650	31,266,000	35,500,000
Kent	47,119	50,630	8,277,293	9,233,726

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for September, 1880, as compared with that for the corresponding month of 1879, shows an increase of 26,094 houses, and of 12,252,023 gallons of water supplied daily.

The following is Dr. Frankland's report of his analyses of the water supply to London during September.—At the end of the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was:—Colne Valley, 1·4; Kent, 1·5; New River, 2·6; New River, 3·0; Chelsea, 3·1; East London, 3·7; Southwark, 6·8; Lambeth, 6·9; West Middlesex, 7·4; Grand Junction, 7·4. Except the supply sent out by the

Chelsea Company, all the water drawn from the Thames, although in every case efficiently filtered, was again unfit for dietetic purposes, owing to the large quantity of organic matter which it contained. Of the water drawn from the Lea, that distributed by the New River Company was of much better quality, but that sent out by the East London Company was little better than Thames water. Both waters were efficiently filtered. The high temperature of the river waters rendered them rapid and unpalatable. The deep-well water supplied by the Kent and Colne Valley Companies was of its usual excellent quality for dietetic purposes, but that delivered by the Tottenham Local Board of Health was, though much better than any of the river waters, less good than usual. Seen through a stratum two feet deep, the waters presented the following appearances:—Kent and Colne Valley, clear and colourless; Tottenham, clear and nearly colourless; New River, clear and of a pale yellow; Chelsea, clear and pale yellow; West Middlesex, Southwark, Grand Junction, Lambeth, and East London, clear and yellow."

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Matter.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrate and Nitrites.	Total combined Chlorine.	Total Hardness.
Inner Circle.							
Thames	25.94	309	0.96	0	114	150	1.6
Chelsea	27.16	304	0.99	0	116	224	1.6
West Middlesex	27.16	304	0.99	0	116	224	1.6
Southwark	27.16	304	0.99	0	116	224	1.6
Grand Junction	27.16	304	0.99	0	116	224	1.6
Lambeth	27.16	304	0.99	0	116	224	1.6
Lea	27.16	304	0.99	0	116	224	1.6
New River	27.16	304	0.99	0	116	224	1.6
East London	27.16	304	0.99	0	116	224	1.6
Deep Wells—Kent	41.74	083	010	0	455	165	2.5
Outer Circle.							
Colne Valley	10.90	066	018	0	344	362	1.5
Tottenham Local Board	40.88	136	019	0	022	041	2.8
Corporation of Birmingham	25.01	182	031	002	264	256	1.9
Corporation of Glasgow	2.90	174	014	0	007	021	0.5

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
* Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

CARLISLE CORPORATION GAS AND WATER SUPPLY.

At the Meeting of the Carlisle Town Council last Tuesday—the Mayor (Mr. J. L. R. B. Croft), first in the chair, the reports of the Gas and Water Works (Mr. J. Hepworth) submitted the annual abstracts of the accounts of the departments for the year ending June 30, and the minutes of the Gas and Water Committee which contained the following report:—

Your Committee have the agreeable duty of again reporting upon a year of continued prosperity in the gas and water departments.

In the statement of accounts herewith submitted it will be seen that the profits realized are as follows:—

Gas department £5492 18 10

Water department 3172 11 9

Total £8665 10 7

Gas-Works.

The various and extensive alterations and additions to the Mill Street Gas-Works, and the Boulton's Grange Works, including the new gasholder and the sulphate of ammonia plant, have been completed and brought into successful operation during the past year. Such improvements have also recently been introduced in the gas-making department as will considerably less the cost of the gas produced, and the loss of gas by leakage has been materially reduced during the past year.

Your Committee regret that the proposed siting to the Mill Street Works has not yet been made.

The consumption of gas continues to increase, although the increase is less than in recent years; but your Committee consider that the use of gas might be extensively increased if the advantages of gas for cooking and heating, and also as a motive power, were well known in this city as in many other places where gas is sold at a much higher price.

An application for a supply of gas to Butcher's has been received during the past year. Your Committee have made the necessary arrangements on this subject, and comply with the application; but no further steps have as yet been taken by the inhabitants.

The following is a statement of the gas made, &c., during the year as compared with the previous year:—

Year.	Gas Made.	Gas Sold.	Uncounted for Leakage.	Percentage of Leakage.	Illuminating Power.	Price of Gas per Cubic Feet.
1880	136,192,000	127,667,000	6,225,000	4.59	18.91	2 9
1879	136,036,000	123,142,000	10,797,000	7.94	18.75	2 9

The whole of the works have been maintained in a thoroughly good condition, and your Committee believe that you now possess gas-works which, for economy and efficiency, may take rank, according to their extent, among the best in the kingdom.

Your Committee have resolved that the sum of £2000—including the annual payment of £200—to be paid into the city fund from the profits of the current year.

Water-Works.

The water-works—including filters, pumps, and distributing mains—have been maintained in thorough repair. Your Committee are of opinion that the filter-beds are not sufficient for the purpose for which they were intended; and they have under consideration the desirability of improving and extending the same, on which they hope to be able to report at an early period.

The further efforts to discover and prevent the waste of water have been attended with much success, as indicated in the following statement:—

Year.	Water Pumped, Gallons.
1879	385,329,361 = 32.6 gallons per head of population.
1880	302,244,208 = 23.6 " " "

Decrease 83,185,153 = 21.49 per cent.

The profits having been greatly increased and the extended demand for water, been further increased, your Committee recommend that the whole of the profits should be applied to the reduction of the water-works loans, and to the extension of the works as hitherto.

(Signed) RICHARD FORSTER, Chairman.

Gas and Water Offices, Oct. 7, 1880.

(The statements of accounts, which were appended to the above report, we shall give in the JOURNAL as soon as they are printed. Suffice it may now to say, in reference to the gas-works accounts, that £5705 has been added

to capital during the past twelve months, making the total to June last £500,476. The receipts from sales of gas were £17,269; and from residuals, £5874; the balance of the profit and loss account being (as stated above) £5192 18s. 10d. In regard to the water-works accounts, the extensions during the year cost £757, raising the total expenditure to June last to £41,542. The water-rates realized £5667, and the profits were £3172 11s. 9d.]

Mr. WANNOP moved, and Mr. MOSS seconded, the adoption of the minutes.

The MAYOR said the statement was highly satisfactory. Alterations and improvements had been going on for a very considerable time, and the water supply was in a most efficient condition. The net profits were £5492, and the way in which the Manager had completed the work with the aid of the Committee reflected great credit upon them. The saving of leakage was something considerable. In most towns it was between 10 and 15 per cent., while in Carlisle it was less than 5 per cent. Therefore, they ought to look on the statement as most satisfactory. He hoped that in future the money paid over to the Corporation would be used for specific purposes. At present it was used up as soon as it came, and nothing was left to carry out the improvement of the town. With such large profits they ought to do something that would be of real and permanent benefit.

Mr. GRAHAM said that the sum of £400,000 had been invested in the gas-works, and he wished to know whether, in striking a balance, the Committee would debit themselves with interest on this amount. If they did so, their profit would be a little less than was shown at present.

Mr. CHURCHMAN suggested that the amount of the capital invested in the gas-works should be invested in the name of some trustees, either in the public funds or in debentures, so that it should not be squandered as it had hitherto been.

Mr. MILBURN said the works showed large profits, and he would like to point out that before the Committee decided any more capital to add they ought to debit themselves with 5 or 6 per cent. on the capital invested. At present they did not charge themselves with any interest at all. If they paid a fair percentage for interest, their profits would not be so large.

Mr. MOSS remarked that though the Gas Committee did not debit themselves with interest for capital they made a large annual deduction for wear and tear. He was anxious that the ratepayers should have some appreciable benefit from the gas profits, as they had always expected it, and the most appreciable benefit would be found in a reduction of the rates.

Mr. PALMER and others wished to continue the discussion, but the Mayor pointed out that it would more properly come up when the report of the Gas Profits Committee was presented, and it was therefore allowed to drop for a time.]

The motion for the adoption of the minutes was then put and agreed to.

Subsequently, the Committee appointed a year ago to inquire into the subject of the disposal of the profits resulting from the gas supply submitted the following minute:—

"The Committee appointed under the resolution of the Council held on the 10th of October, 1879, first in the chair, the money first paid to time paid since 1877 from the profits of the gas-works to the city fund, amounting to £4480, in addition to the annual sum of £200 in respect of the Maingard, has already been absorbed in the city fund capital account, and has been expended by the Council in the improvement and extension of the Butter Market, Police Office, and other corporate property."

The discussion previously interrupted was then resumed.

Mr. PALMER said, with reference to the suggestion that the profits of the gas supply would not have been so large if the Committee had debited themselves with interest on capital, that the profits would have been considerably more had it not been that they had now taken land to a considerable extent, which at present they did not use, but for which they had to pay a very large rent. Some people said it did not matter what they paid, as it was only taking the money out of one pocket and putting it into another. However, they paid a heavy rent for a good many acres of land, of which they only occupied a very small portion for one gasholder and the sulphate of ammonia works. They had also expended a large amount on a new gasholder. If they had gone on under the old system their profits would have amounted to £7000 or £8000. The Committee were doing exceedingly well with the works they had under their charge. The appropriation of the money paid annually to the Corporation had been alluded to by Mr. MOSS and Mr. CREIGHTON. The money paid over up to the present time had been taken for several purposes, whereas it ought to have been used for the improvement of the town. The Mayor observed that the gas-works had not any credit at all. He threw out the suggestion that the Council should take seriously into consideration the idea of lighting the lamps of the town free. This would save the town some £1700 a year, and would take 3d. or 4d. off the rates. It would be better than reducing the price of gas, though if they took 3d. per 1000 off it would amount to £1600 or £1700. But gas was as cheap in Carlisle as in most towns in the kingdom; for, in some towns they paid 2s. 4d. for 16-candle gas, while in Carlisle 2s. 9d. was paid for nearly 19-candle gas, so that if the gas were cheaper elsewhere its quality was lower. The Mayor said the better the quality of the gas, the more the ratepayers would be obliged to pay. He said that the gas-works had been a great benefit to the town, and that the gas-works should be kept in a separate fund to be applied to a special object.

Mr. BINKING moved that the Committee who had made the report then made, should meet again for some endeavour to arrive at the best possible plan to adopt in the future as to how the money should be cared for. It was desirable, he said, that the money should be husbanded for the purpose of some great improvement in the town. The best thing would be for the Committee to discuss the right investment for the money in the next time.

Mr. BENDLE seconded the motion, saying probably the money should be invested, but he should like to leave it to the Committee to make a suggestion as to what should be done with it. He had a strong feeling on the subject. He was almost inclined to move that the money which had been paid to the city fund should be repaid by the Corporation and invested separately. He would not go to that length, but would let bygones be bygones. The money should be kept in a separate fund to be applied to a special object.

Mr. WANNOP said two of the means by which it had been employed were actually paying concerns. They had invested money in the Butter Market, from which there was an annual revenue, and why not take a portion of the revenue as interest on the capital invested? By that means they could pay the money back. Mr. Bendle's suggestion was a very proper one, and he had said that a portion of the money, at any rate, should be repaid out of a general fund or a special fund.

Mr. WANNOP inquired if the interest on the capital account was not due to the city fund.

The TOWN CLERK said that the money spent on the police office, which it had not been defrayed from this contribution, must have been raised

SOWERBY BRIDGE LOCAL BOARD GAS SUPPLY.

At the Ordinary Meeting of the Sowerby Bridge Local Board on Wednesday, the 6th inst., in accordance with a notice of motion which had been given,

Mr. HOYE proposed a reduction in the price of gas of 5d. per 1000 feet with effect from the present. He maintained that direct taxation would conduce to more economical expenditure of both gas profits and rates. It was, he said, perfectly clear to him that the principle of taxing gas consumers to relieve the rates was not sound; and he showed that Sowerby Bridge was charging more for gas than any other public body within a large area. The last balance sheet of the gas department showed a profit of £2097 7s. 8d., and the Board transferred to the sinking-fund £1097 11s., leaving a surplus to deal with of £717 16s. 8d. To this should be added interest reduced to the amount of £171 18s. and a reduction in the cost of coal of £290, and this would bring the estimated profits next year to £1999 9s. 8d. He calculated that a reduction of 5d. per 1000 feet from Oct. 1 to March 31 next year would absorb £655 17s. 1d., showing a balance for the relief of the rates of £748 12s. 7d. If the proposed reduction were agreed to, he thought it likely that the profit would soon be as much as ever, and that next year a further reduction of 5d. might be made. Assuming that coal would advance in price, the price of coke and tar would advance also; moreover, an advance in coal meant better trade, and they now had gas-works equal to an increased consumption of nearly double the amount that was at present required. When the capital now invested was fully utilized there would be a decrease in the interest on the capital of 18. 3d. per 1000 feet further reduction of 5d. per 1000 feet would be an equivalent multiplying equalled a reduction each year of about another 1s. 3d. per 1000 feet sold. The consumers who were also ratepayers would scarcely feel any difference, for on an average they were rated at about as many pounds as they consumed thousand feet of gas yearly, and if the money saved was applied to the rates, the rates would be reduced. As to the rates, if they would lower the rates about 5d. in the pound. But they had in the district firms who were rated, but who were not consumers of gas; and he (Mr. Hoyer) held that for consumers to contribute to the rates from gas profits was simply paying such firms a portion of their rates. Again, additional profits must be dealt with each year. Besides, if they were allowed to accumulate, the present estimate would be an amazing fortune for their successors. He (Mr. Hoyer) thought they were doing quite enough, if not too much, in paying off £1000 of capital each year. It might be suggested that they should reduce the price of gas within the district only; but if they reduced both 5d. per 1000 feet, they would then be reducing the rates of the district less than the ratepayers, which any reasonable man must consider enough.

Mr. BATTERSEY seconded the motion.

Mr. SIDDALL opposed it, and said he should continue to be averse to any such change until they had reduced the debt to something like £20,000. It was agreed with Mr. SIDDALL that the Board should be allowed to reduce the debt in order that the interest on it might be saved.

Mr. GREENWOOD thought Mr. Hoyer had very well stated the reasons for the suggested reduction. At present the millowners and cottagers were called upon to suffer, and such ratepayers as the Canal Company and the Corporation, whose houses were in the district, were not to share the benefit. There was neither justice nor common sense in this. Mr. Hoyer's proposition was a reasonable one; whatever the Board did they could not alter that fact. Some millowners let off a portion of their premises—himself among the rest—and the arrangement invariably was that the owner must pay the rates and the occupier for the gas; therefore, the present state of things they did the occupier an injustice. As for the outsiders, he candidly admitted that, if he were living, say, in Ripponden, he would be spirited enough to advocate the manufacture of their own gas; he would not pay Sowerby Bridge 30 per cent. profit on the article.

The CHAIRMAN took it the Board were there as the representatives of the ratepayers generally. They had secured gas-works at an enormous cost, and as they had to run all risk of accidents, they were entitled to a fair profit—the consumers had nothing more to do with the matter. He was not at all surprised that the present rate of gas should be disturbed, especially as they were about to undertake great sewerage works. When they had a profitable concern, let them make good use of it; if they gave all the profit away to one class of customers, there would be nothing to divide.

Mr. HOYE briefly replied on the debate; and, on the motion being put, it was lost—only four members of the Board supporting it.

THE PROPOSED PURCHASE OF THE NEWTONWARDS GAS-WORKS BY THE TOWN COMMISSIONERS.

At a Meeting of the Newtonwards Town Commissioners on Wednesday, the 6th inst.—Mr. T. BEATTY in the chair—the question of the purchase of the local Gas Company's works was under consideration, and the reports of Mr. G. Anderson, acting on behalf of the Company, and of Mr. A. Silverthorne, for the Commissioners, were read.

Mr. Anderson stated that the works, which have been very well laid out, and most substantially built, and are, in most respects, equal to double the present business. He finds, from the published accounts for the last three years, that an average profit of £741 12s. 2d. has been achieved, which multiplied by 16½—to which the Company are only entitled, he has noted a reduction of 5d. per 1000 feet for the plant, and, however, are able to earn an increased rental, valued at £4044 6s., making a total value of £16,404 8s. 9d., from which there is deducted for depreciation £2130 16s., leaving the present value of the undertaking at £14,269 12s. 9d. Mr. Anderson considers that this sum of £14,269 12s. 9d. is less than it would be on a sale of the works, and that the Company might ask if they were unwilling to sell, but he was informed that they are willing to sell; hence he did not include some items that were sometimes given in similar cases, such as a number of years goodwill, and compensation to retiring officers. These he had balanced against the fact that he considered that the present value should reduce the price of gas to 6s. per 1000 cubic feet. Mr. Anderson believes it would be possible to obtain a solvent tenant to lease the works, and supply gas at 3s. 6d. per 1000 feet at the consumers' meters, leaving 2s. 6d. for interest on capital invested, which, on only 7 millions, would yield an annual rent of £875. Mr. A. Silverthorne considered that the Company were not to be taken in by the rates, which you might allow a sum of, say, £500 to pay for a thorough examination, more particularly of the service-pipes—for the rental I have indicated would not be earned from your works in their present state."

Mr. Silverthorne considers the works substantially erected, but not in a strict proportion to one another, less the various pipes. He instances, if the mains as being too large and the storage as excessive, while the retort-beaches and purifying apparatus are only sufficient for the present requirements. Mr. Silverthorne notices that, as usual in small works, they

have not been judiciously laid out with a view to duplication, but that the site is sufficient to admit of this being done when, if ever, such an extension is needed. While the works appear substantial, Mr. Silverthorne thinks repairs and renewals have been somewhat neglected. The retort-beaches, he says, have been worked with unsound reports, thus fracturing the bed of the area of the retort-beaches, and thereby diminishing the different portions of the manufacturing plant, the report states that the storage capacity—67,850 cubic feet—is in excess of the requirements, and in calculating the value of the undertaking, a liberal allowance is made for this excess. Distributing plant is next dealt with, and Mr. Silverthorne considers the mains to be much larger than they ought to be. There are in all 7775 yards of mains laid. The leakage in the distributing plant is estimated at 27.77 per cent. of the production, and means are recommended for the reduction of this large loss, which is attributed to defective services and the excessive diameter of the mains. Mr. Silverthorne says, in arriving at a correct valuation of the works, he took as the basis of his calculation the present price of gas (7s. 6d. per 1000 feet), the present sale of gas, the present cost of coals, the present return from residuals, and, as far as consistent, the present scale of working expenses. The price of gas he considers excessively high, and he attributes the diminution in the sale of gas since 1877 to that cause. The report continues—"Should the Commissioners proceed in the transfer upon the terms indicated here, I have no doubt that renewed confidence in the undertaking will promote an increase in the sale of gas, for it is only on an increase in the sale that the Commissioners could legitimately find the means of reducing the price." Mr. Silverthorne considers that the terms of the undertaking would develop in time into a remunerative concern to the ratepayers in other senses than by merely providing cheaper gas," which, however, he considers to be essential, as individual millowners and large employers of labour could manufacture their own gas cheaper than it is supplied at present. In estimating the working value, Mr. Silverthorne says that there will be 4723,657 cubic feet of gas at a uniform rate of 7s. 6d. per 1000 feet sold, £1771 4s. Cost of coal at the present price, 804½ tons at 16s. 7d. per ton, £667 1s. 3½d. The residuals will realize £157 15s. 4d., thus leaving the net cost of coal £479 5s. 11½d. The total cost of manufacture, including 18,000 lbs. of sulphur, £80, and sundries, £58 7s. 8d., net cost of coal and manufacture is therefore £1013 15s. 1½d., leaving a gross profit on gas manufacture of £737 8s. 10½d. From this sum deductions, amounting to £238 5s. 10½d. for bad debts, depreciation in building, and interest on a floating capital of £750, is taken. The remainder, £459 8s., calculated at 16½ years purchase, amounts to £8555 10s. 8d. Deduct the working services, £180. The net value of the house property is taken at £170, which, with allowance of £750 for extra storage, makes the net value of the undertaking £9386 10s. Including a floating capital of £750, and £186 for renewals, together with expenses of purchase, £257 10s., the amount required by the Commissioners would be £10,580. If the gas is purchased at 7s. 6d. per 1000 feet, the Treasury would have to pay 40 per cent. by annual instalments, the interest yearly would be £514 17s. 10d., which would still leave a balance in favour of the Commissioners from the profit of the undertaking. Mr. Silverthorne says his valuation depends entirely on the Commissioners' taking over the concern free of all mortgage debts, liabilities, or any kind of encumbrance. He also recommends cautious advice, as to working, from professional experts, and asserts that without this successful results cannot be expected. The concluding portion of the report is as follows:—"On the terms here indicated the Town Commissioners may confidently acquire the works, but I am equally of opinion that a higher price would be given to me, I should certainly not express the same view of the proposed purchase."

After the reading of the reports a desultory discussion arose as to what action should be taken on them.

Mr. WALKER wished to know if the Commissioners could proceed with the negotiations without again consulting the ratepayers.

Mr. BEATTY thought the town clerk might be asked to do with the question. The ratepayers had authorized the purchase, and appointed a Valuator whose report was now before them.

Mr. KELLY thought the only thing to be done was to get the money.

Mr. MENZON said that seeing the great discrepancy in the two valuations—£10,580 and £9386—the arrangement should be made to be made by the ratepayers and the Commissioners, as to what sum the former would accept for the works—what sum they would concede from Mr. Anderson's valuation. He thought the proper course would be to instruct the Clerk to ask the Company if they would accept Mr. Silverthorne's valuation, or what abatement they would make on Mr. Anderson's estimate as follows:—

It is finally resolved that the work should write to the Secretary of the Company, asking him to name a price for the works.

THE LANCASTER CORPORATION WATER-WORKS ARBITRATION.

SURVEYORS INSTITUTE, WESTMINSTER.—MONDAY, OCT. 11.

GARNETT V. THE CORPORATION OF LANCASTER.

The arbitration between the Corporation of Lancaster and Mr. Henry Garnett, of Wyreside, as to the amount of compensation to be paid to him for damage done to his land by the Corporation taking an additional supply of water therefrom for the town, again came on for hearing this day. The case has been several times referred to in the JOURNAL, and the facts were fully set forth in the number for Dec. 2 last year (see p. 313, J. 1879). Mr. Garnett, who is a well-known and highly respected citizen of Lancaster, in 1876 obtained an Improvement Act, one part of which related to water supply, which was to be derived from streams rising upon land belonging to Mr. Garnett, a gentleman of property in that part of the county. The area of land was about 15,000 acres, the streams crossed the land, and the Corporation were to lay pipes to take the water thereon, and convey it into Lancaster. Mr. Garnett claimed compensation to the amount of £30,000, and proceedings for arbitration on the matter were taken under the Lands Clauses Act, Mr. J. F. Bateman, C.E., being the Arbitrator. The case came on for hearing on Oct. 10, 1880, at Westminster, on the 3rd of October last year, but at the outset of the proceedings the Arbitrator intimated that while he would hear any amount of evidence of fact which either side chose to bring, he did not want evidence of opinion. He would, he said, pay every attention to matters of fact, and on these would found his own opinion, and he would not be giving his award on hearing this case. The Counsel representing Mr. Garnett (Mr. Higgin, Q.C.) intimated his intention of withdrawing from the case, as it was impossible for him to go on with it after the observations of the Arbitrator. Mr. Webster, Q.C., for the Corporation, commented on the impropriety of the course adopted by Mr. Garnett, and said that the Corporation were not to be taken in by the arbitration conducted by Mr. Bateman, and to have the award made by him. The Arbitrator referred to the awkward position in which he was placed by the course which had been taken, but stated that he would go on with the arbitration and make his award in writing. The arbitration was accordingly proceeded with on the 3rd of October last year, but there was no appearance on behalf of Mr. Garnett. Mr. Mansergh (Engineer to the Corporation), Mr. Swainson (Town Clerk of Lancaster), Mr. F. Fenwick, C.E. (of Leeds), and Mr. J. Newton, C.E., were examined on behalf of the

Corporation, and after these witnesses had been heard, the Arbitrator intimated that he would give his award in writing on the 1st of November following. Mr. Garnett's Counsel then applied to the Vice-Chancellor of the County of Lancaster, and the proceedings stayed until an application could be made to the Queen's Bench Division to set aside the reference, on the ground that the course taken by the Arbitrator amounted to misconduct justifying such an application. This was accordingly done, and the Court expressed an opinion that it would be better for the parties to agree upon another Arbitrator, for the Arbitrator went on as it was, and an award was made, it could not be allowed to stand, a false principle having been adopted by the Arbitrator which went to the essence of the case on one side. On the 18th of the following month the case was again before the Court, when Mr. Garnett's Counsel stated that Mr. Estlin desired to be relieved of the arbitration, which the Court had not taken to pay all the costs, and the matter was then dropped, on the understanding that the parties had agreed to submission to another Arbitrator. Mr. Gully, Q.C., was accordingly chosen, and the proceedings were now commenced *de novo*.

Mr. W. H. HOGGIN, Q.C., and Mr. HORACE BROWN, appeared for the plaintiff; Mr. WEBSTER, Q.C., and Mr. R. S. WHIGHT for the Corporation of Lancaster.

Mr. HOGGIN, in opening the case, said he could not claim for Mr. Garnett more than he was entitled to by law. The Corporation of Lancaster some time ago took steps to improve their water supply, and for this purpose obtained several Acts of Parliament. In 1832 they had no water-works, but an Act for their construction was obtained in that year. The first works were of a very simple and primitive character, but they were sufficient up to 1864, when another Act was obtained by which the Corporation were empowered to acquire 400,000 gallons of water from the River Wyre. By the 1832 Act their money powers were £30,000, and in 1835 they were doubled. Under the 1864 Act a line of pipes was laid through Mr. Garnett's land at Nee Fell and Dukenshaw Fell to the Tarnbrook Fell, for the purpose of draining those fells. There was no reservoir, and the works had not successfully carried out at a small expense. This Act empowered the Corporation to supply 400,000 gallons of water per day additional from Mr. Garnett's land, and for this privilege he agreed to accept a sum of £100 a year; but the water was to be so taken that there was to be enough left for the flocks and herds and for agricultural purposes. When Mr. Garnett then started a large number of granges, he said that he was called upon to give up in 1876 by a subsequent Act, which was obtained in consequence of a report by Mr. Mansergh that the consumption of water in 1875 was calculated at 875,000 gallons, and the Corporation had only power to supply 700,000 gallons. He estimated that the amount required 29 years afterwards would be 4,000,000 gallons, and he recommended that provision should be made for such a supply. By this Act new pipes were laid down, and a storage reservoir was to be constructed to provide against dry seasons. The pipes were calculated to supply 1,100,000 gallons a day from Mr. Garnett's fell land, and his contention was that for the purposes of the Corporation the land was to be used for purposes would be entirely defeated and annihilated by the taking of this water. The Corporation were empowered to take from the fell every drop of water they could intercept by this line of pipes, whether the respective brooks were mentioned in the Act of Parliament or not, and it was very well known that the taking of the water for the operation would render the land lying to the south of the new line of pipes, if not wholly dry, so dry as to be perfectly useless for the purpose for which the land had hitherto been used. The Corporation had increased their taking powers from 400,000 to 2,000,000 gallons a day, of which 1,000,000 gallons was to be drawn from Mr. Garnett's land alone. There was a provision in the Act that care should be taken that a sufficient quantity of water should be left running down the streams for the use of the flocks and herds, for farmhouses and buildings, and for agricultural purposes, and the pipes must be laid and the supply drawn off without a nuisance or interference with the use of the land. He never had been made by the Corporation to give effect to this section of the Act. Certain small water-troughs had been erected, but they would be useless in any time of drought. If this were the way in which the provisions of the Act were to be carried out, it would be wholly insufficient for the purposes of the land, and Mr. Garnett would be injured, and therefore he had a right to compensation. After stating that the new Act provided for the supply of Carnforth and other places, the learned Counsel read the notice to treat. It set out that the length of pipe on Mr. Garnett's land was 6865 yards of main-pipe and 1558 yards of branch. This was in addition to the old pipes, and as to the whole of these the Corporation of Lancaster had power to enter Mr. Garnett's land for the purpose of maintaining, renewing, watching, and regulating, and his sporting estate would thus be liable to be visited by the servants of the Corporation at any time. He did not say the Corporation would triflingly harass Mr. Garnett, but this could not be done without nuisance and annoyance. But so far as the land was concerned, an agreement had been come to between the parties, and the question for arbitration was as to the easements and the damage done by taking the water. The easement consisted of the right to dig and excavate for the purpose of laying pipes and replacing and inspecting them, and the right to have access to the land for the purpose of the pipes. The length of pipe line was doubled, and there would be requisite a double amount of inspection, and the injury would be greater proportionately. The estate was devoted exclusively to sporting purposes, except so far as it was used for the purpose of the drainage of the estate, and the position of the estate was such that it was really ought not to go; and instead of this fell land, where the breeding of game took place, being kept perfectly quiet, it would be liable to great interruption. The game would be disturbed, and the consequence, as he should show by witnesses, would be that the letting value of the estate would be diminished, and that the Corporation would be liable to pay 11,899 acres, of which 7957 acres were moorland, and part of the moorland consisted of so much of the watershed of 2700 acres as formed part of the estate. The enclosed land was 3872 acres, and at the mansion house at Wyreside there were 70 acres. One of the great points of the estate was that the ground was so high that it was better than any in the neighbourhood. It was true that a water-pipe had already been carried through the estate without doing appreciable damage, and with this Mr. Garnett must always have been content. But now it had been more than doubled, and the injury that had been so caused would have to be compensated for in money. If the number of grouse were diminished, it would seriously decrease the letting value of the estate, and this formed one of the grounds of claim in the present case. Mr. Garnett was a country gentleman, a county magistrate, and Chairman of Quarter Sessions. All his interests were thus bound up with the land, and he would not be contented with a small compensation should be compensated fairly and not ridiculously. The difference between what his estate would previously have let for and what it would fetch now was the figure at which compensation should be fixed.

TUESDAY, OCT. 12.

Mr. Henry Garnett, the plaintiff, described his property as consisting of 7957 acres of moorland, 3872 acres of inland and woods, and 70 acres of

park land surrounding his mansion at Wyreside. He had known the estate since 1836, and it had been a shooting and sporting estate ever since he had been acquainted with it. It was situated in a very fine position, and the excellent supply of water, which was absolutely essential to the breeding of grouse. The Corporation were now taking the water from his moorland springs by pipes. The best breeding-grounds were immediately below the new pipes which had been laid by the Corporation under their late Act.

In cross-examination, witness stated that there were 701 acres of land round his house. This was separated from the moorland, which was about 3 miles distant, and which consisted of 11,700 acres. There were 4212 acres of moorland on the north and 3600 on the south. The workmen laying the water-pipes had disturbed the north moor. Apart from the water-pipes, the north moor was very much better watered than the south. There were several springs that bubbled up and became running streams. To intercept all the water coming down, the Corporation would be obliged to cut off the whole channel of the water-course or put the springs. Who he had asked along the line of pipes, recently he did not see a single running stream that he had noticed there before; they seemed to be all intercepted. He did not examine the actual point of interception, but if they had not been intercepted they would have been running across the line of pipes which he followed. He saw two small troughs on the south side of the pipes, and they might have been water in them. He agreed to £30,000 as the amount of the claim. He arrived at it in this way: A rent of £1200 a year at 4 per cent.; he put one halfpenny for every 1000 gallons, and he reckoned 1,300,000 gallons a day. He did not add anything for compulsory sale. He knew that he had a right to sell the water for 1000 gallons. He thought it was his property, being on his land. That was the only basis of calculation that he knew of before the claim was sent in. The whole of the shooting over the 11,000 acres was assessed by the Assessment Committee at £922. In March 18, 1876, he attended before the Corporation, and he was told that they had taken 400,000 gallons from the Corporation for the right to lay the first series of pipes in 1861, but it was a foolish bargain.

Mr. Patrick Mather, C.E., a Surveyor, residing near Perth, said he had visited the plaintiff's moors. Before the laying of the pipes the Tarnbrook Moor was remarkably well watered. He thought the operations of the Corporation would be to take all the water, and grouse and many other birds would be lost. He had seen the best breeding ground was between the old and the new mains. He calculated the whole breeding-ground at between 1800 and 2000 acres. He understood that the Corporation were going to leave three good springs between Tarnbrook and Oakenshaw Fells. These would suffice for the neighbourhood of the springs, but for the whole of the moor the water would be taken. He estimated the deterioration in the letting value at £500 a year.

Cross-examined: At 33 years purchase the loss to the plaintiff would be £19,800. He could point out branch-pipes which intercepted the whole of the water from the springs. He estimated that the value of the water at £15 a year, which was worth £1300 a year was worth £1300 a year to let with the house, which was worth £50 a year.

Re-examined: He had seen the moor both before and after the pipes were put down, and considered it was now materially deteriorated.

By the Arbitrator: His estimate of the loss to the grouse shooting only. He calculated that 1200 brace a year might be shot. In Scotland moors let at £1 a brace, and this place was more accessible.

WEDNESDAY, OCT. 13.

Daniel McIntosh, gamekeeper to Sir E. Mackenzie, of Ross-shire, gave evidence as to the value of the estate for grouse-breeding purposes, which, in his opinion, would be materially interfered with by the abstraction of water from the moors.

Mr. T. Statter, land agent, of Manchester, said he knew Mr. Garnett's estate, and his attention had been drawn to the Corporation Act of 1876, the powers of which were as extensive as they could possibly be. The Corporation had power to take a total of 2 million gallons of water every day from the moor, and the Corporation had taken 400,000 gallons from which they had power to take 1,300,000 gallons, covered an area of 2700 acres. Supposing the Corporation were able to carry out the works mentioned in the 19th section of the 1876 Act, they could not do so without material injury to Mr. Garnett's estate. After the Corporation had taken 400,000 gallons of water from the moor, the moor would be very seriously injured as a grouse moor. Assuming that the Corporation took from Mr. Garnett's property 1,100,000 gallons of water, there would not be left one drop in the dry seasons; and witness was of opinion that the Corporation could not in dry times get anything like the quantity of water that they expected. The piece of moor touched by the Corporation would, in his (witness's) opinion, let easily for £500 a year. He knew that in some districts, in connection with the Liverpool water-pipes, for example, the inspection of the pipes was a great annoyance. The quieter the moors were kept the better for the game, not only during the breeding season, but at all times, and the inspection of this moor by the Corporation officials would do great injury to the moor as regarded grouse breeding. The estates of Mr. Garnett gave a very good range of ground for grouse shooting, and the whole range would let for at least £1000, and probably for £1200 a year. He was of opinion that the Corporation would do great injury to the moor as regards grouse breeding, and the abstraction of water would very seriously injure it. In dry weather there would be no water left for agricultural purposes and for the use of the flocks and herds; there was not at present sufficient water for this purpose. He took the line of pipes to measure 7192 yards, and he valued it at 2d. per yard per annum at 25 years purchase, or 5s. 2d. per yard. The branch pipes he estimated at 2s. 8d. per yard. He took it that the moor was depreciated one-third of its value—to the extent altogether of £350 a year. His estimate of damage was made in this way: Depreciation of 7957 acres at 5s. 2d. per acre a time, and the inspection of this moor by the Corporation officials would do great injury to the moor as regarded grouse breeding. 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entire year. He had no information as to the yield of any specific spring, or of the water taken from any of them. As to the grouse question, the breeding-ground, the grouse would not be affected by the abstraction of water from Tarnbrook Wyre at the point to which the new pipes were laid. Assuming the Corporation laid a portion of the flow from day to day—that was to say that they never totally intercepted the spring—in fact, if there was as much water left in the stream as now ran down there would be sufficient water for the grouse. If 30 per cent. of the water of each stream was left it would be sufficient.

THURSDAY, OCT. 14.

Peter Melrose, head keeper to Mr. Garnett, said he thought the new line of pipes would do a great deal of damage to Mr. Garnett's estate as a breeding-ground for the grouse, and he did not think there would be sufficient for the grouse, and it was between the new pipes and Tarnbrook Wyre that the principal breeding-ground lay. He agreed with other witnesses that water was absolutely essential to grouse, and was of opinion that when the pipes were in full operation there would be no water that would find its way below them. There were no regular springs below the pipe line, and he knew of no springs above the old line of pipes except those taken by the Corporation. In dry weather nearly all the moor above the old line of pipes was quite dry. Between the old and the new line of pipes there were twelve springs, and if these springs were cut off there would be no water in the stream beds in dry weather.

Mr. G. Storey, an estate agent of Bromley, said he had been over the line of pipes, and had examined the springs. He understood that the Corporation had power to take 2 million gallons of water per day from the watershed. He noticed especially the springs and Tarnbrook Wyre. Assuming that 1,000,000 gallons were taken per day in the driest season from that moor, it would seriously damage it as a grouse moor. Judging upon figures put before him he should think that, if the Corporation took 2 million gallons of water a day they could not leave sufficient to comply with section 19 of their 1876 Act. Even assuming that there was sufficient water for the grouse, and he knew it was not, there would be sufficient for grouse-breeding. He said he thought the trouble put down by the Corporation on the line of pipes, and from one of them there was a fill of water flowing which was very soon lost in the ground. That flow of water might be sufficient for flocks and herds, but not for grouse. He had made a valuation of the damage the moor would sustain by the Corporation's water-works, and it amounted to £32,740.

In cross-examination, witness said he had never before made a valuation of this kind, but he had seen Mr. Statter's figures while he was preparing his own, and believed the valuation was Mr. Garnett's.

Mr. HIGGIN here intimated that he was not prepared to proceed further with the case at present.

Mr. WEBSTER protested against the course pursued by the Counsel for the plaintiff.

Mr. HIGGIN said he had simply to consider the interests of his client, and in doing this he should have to call more witnesses, who were not at present prepared to give evidence.

Mr. WEBSTER did not think it was fair, in a case of this kind, to break off in order to get up a fresh case.

Mr. HIGGIN said his learned friend had a case which had, throughout the cross-examination, been studiously kept from his (Mr. HIGGIN's) knowledge.

The ARBITRATOR said if any information had been improperly kept back on either side, he himself would adjourn the case to any time he might think necessary; but there did not appear to be anything of this kind to complain of.

After further hearing of the case was then adjourned to the 10th of November.

THE RECENT PURCHASE OF THE COLCHESTER WATER-WORKS BY THE TOWN COUNCIL.

A Meeting of the Colchester Town Council was held on Monday last week, the Mayor (Mr. Knott) presiding, when the following report of the Water-Works Committee, in reference to the above-named transaction, was read:—

The first matter will be the carrying out your previous resolution for provision of the money by borrowing on the general district rates the £38,500 sanctioned by the Local Government Board. The several mortgages for raising this sum will be as follows:—For £60,000 to the Public Works Loan Commissioners, repayable by half-yearly instalments over 50 years, and interest at 4 per cent. per annum; and for £38,500 in divers ways, sums to differ in rate of interest, and term of years, for the first five years at 3 per cent. per annum; for the second five years at 3½ per cent. per annum; and for the remainder of the 20 years at 4 per cent. per annum, with a contingent interest of 1 per cent. per annum in each year during the first ten years in which the net revenue of the Water-Works Company should reach £2000.

It will be seen that, subject to the usual charges for preparing the mortgages and stamps, there will thus be £38,500 available for the purposes of the purchase.

It is necessary next to bring before you the accounts of the purchase-money, interest, and costs claimed by the Water-Works Company, and upon which, after giving credit for income received since June 30, 1879, according to the provisions of the Act, they make a balance due of £21,085 3s. 5d.

It will be borne in mind by the Council that on completion of the water-works purchase the Authority will be put into possession of the water-works, and from that time will have the control and management, so that all necessary arrangements contingent on the change should be considered without delay.

Mr. GOODY moved the reception and adoption of the report.

Alderman HAWKINS seconded the motion, at the same time expressing his disapproval of the scheme, which, however, he said he was glad to find had come to a satisfactory conclusion.

—Lengthy discussion.

Mr. WICKS proposed that the Mayor affix the common seal of the borough to the conveyance of the water-works property to the Corporation.

This motion was seconded by Mr. PRINCE, and carried unanimously, and the Mayor affixed the accordingly.

The Town Clerk then read the indenture of mortgage to the Public Works Loan Commissioners for £60,000, to be repaid in 50 years.

Alderman HAWKINS moved, and Mr. COLS seconded, that this mortgage be sealed, and it was agreed to.

The remaining £38,500 was borrowed on the following conditions as to interest:—3 per cent. up to 1885, 3½ per cent. up to 1890, subject to the condition that if the net income of the water-works in any one year during that time reached £3200, an additional ½ per cent. should be paid. During the remaining ten years a fixed rate of 4 per cent. will be paid.

The common seal was then affixed to the 31 mortgage grant for the remaining £38,500, and the indentures were ordered to be handed over to Mr. Bright Wool (the Borough Treasurer). The Committee were also empowered to "act for the Corporation with reference to all such orders on the Treasurer, to draw such cheques, and to do all such further acts, if any, as they may from time to time think requisite."

At the meeting of the Board of Directors of the Sheffield Water Company on the 11th inst., Mr. William Cockayne resigned the office of Chairman, owing to failing health, and Mr. Percy Smith was appointed in his place.

NORTH OF ENGLAND GAS MANAGERS ASSOCIATION.

(Concluded from p. 577.)

Mr. W. J. WARNER (South Shields) read a paper entitled

NOTES ON THE WORK OF PURIFICATION.

Though the theoretical knowledge of the purification of gas has advanced, the practical operations of gas manufacture in this department remain much the same as they were in the earlier days of gas lighting. The same material, too, is as necessary now for complete purification as it was then. Though oxide of iron may do a portion of the work, yet lime must be employed to complete it. So of the apparatus now in use. The old form of vessel, with perforated trays, water-lute covers, and centre-valve, appears to be as necessary now as when the arrangement left the hands of the gifted Malam; and purifiers are not more simple now than then, neither are they more efficient.

Progress, however, has been made, chemical and mechanical, by which the higher standard of purity demanded has been reached. The name of the late Mr. Frederick J. Evans will be ever associated with purification by oxide of iron, as will the labours of Mr. Patterson in defining the work of the two materials employed—lime and oxide.

Mechanically, individual apparatus to stand out in bold relief from his compeers. The late Mr. Alfred King, of Liverpool, laboured at this, as he did at every portion of our plant. Of the improvements, we may say the deeper lute and the wooden grids are a necessity in the use of oxide. The latter, however, when used for lime, is an economy that we may claim as an advance in purification.

In the work of construction, and in the mechanical arrangements of manipulation, progress doubtless has been made. In manipulation I include the work of preparing the lime, and putting it into the condition of readiness; and with this I must associate the names of Mr. Forshall, of New Orleans, and Mr. Cleland, of Liverpool. Here we find considerable progress.

The quotation which I will take the liberty of reading from "King's Treatise on Coal Gas" is the greatest proof of this: "Mr. Forshall says: I submit, as the result of actual experience—1. That the granulated hydrate, containing much water as it can best come to retain without becoming adhesive under careful handling, will purify a much greater quantity of gas per bushel than when in the dry and almost dusty state in which it is generally employed. 2. That in the former condition it offers less resistance to the free passage of the gas through the purifiers. 3. That numerous thin layers of lime can, therefore, be advantageously consolidated into a lesser number of greater thickness, with economy of labour and wear and tear."

Year.	Average Daily Production for December.	Number of Layers of Lime worked through.	Total Thickness of Lime.	Maximum Thickness of Lime in Pockets.	Mean Free-Outlet of Gas per Bushel of Unslaked Lime.	Cubic Feet of Gas per Bushel of Unslaked Lime, December.	Cubic Feet of Gas per Bushel of Unslaked Lime, whole Year.	Condition of Lime.
	Cub. Ft.		Inches.	Inches.	Inches.			
1870	903,000	6	12	15		7,752	9,653	Dry during half the year.
1871	1,010,000	9	27	13	5	11,222	10,000	Wet.
1872	1,007,000	9	36	15	5	11,854	11,807	Wet.
1873	953,800	9	54	17	5	22,084	17,291	Wet.

As these quotations give only the conclusions and results, I would commend to you the careful reading of the entire article, as well as the whole of the chapters on "Purification" in the "Treatise."

There can be no subject of greater practical value to engage the attention of eminent chemists, or those of the highest attainments amongst ourselves, than this work of purification. Carried as coal gas is, not only in its nature, but in its treatment, to the verge of impurity, and the most delicate persons—where it is so useful, I may say, so valuable for heat and light, the article should be of the greatest possible purity. Financially, too, the subject is of considerable importance to gas companies, from the frequent pressure of public authorities for a reduction in price, and the slight regard of the public to the cost of the gas. Here, then, is work for men of the highest attainments; and an author of an essay on the work of purification should have, theoretically and practically, that acquaintance with the science of chemistry to which I can lay no claim. The title, however, which I have given to my paper is very broad, and under this I will excuse myself for the shortcomings of my contribution to the subject.

My notes, then, are of a general practical, rather than of a chemical character; they were suggested by the flattering remarks of Mr. John Pattinson, the able chemist, of Newcastle, who referred to our last meeting to the sulphur question at Shields.

The facts of the case are these: Under our Act of 1867 we had a purity clause of 5½ grains of sulphur per 25 feet of gas consumed, as tested with the Lethaby apparatus. The gas was thus tested for the Company, through some of our largest makers, year by year, by one of the leading chemists; but the Corporation did not have any test made. The highest result was 19.30 grains and 39.90 grains, and the lowest 7.33 grains. The Act of 1879 lowered the standard to 20 grains, and prescribed the Referees test. The Corporation then decided to have the gas tested monthly with the illuminating power. The first test was made at the end of the November after the passing of the Act, as soon as the Referees apparatus was fixed, and showed 28.5 grains in the work—there was an increased make of gas and an alteration of washers. Over a brief period the sulphur in the gas varied from 20 to 30 grains per 100 feet; it was then brought down to 8.7 grains, and the average to the 30th of June was 10.7 grains, and the lowest through that period 4.9 grains. Since that date it has been 6.2 grains.

How is this done? But a few years ago the reply to this question would have been listened to with great attention. Of course I can give but one reply: By working the vessels in such a manner as to continue some of them in action for a longer period than could be done when they were taken in succession. The first and last vessels in the series were taken more frequently than the two intermediate ones, which became more foul.

How shall I say? With sulphur; or, in other words, were used as sulphide of calcium, and so were better fitted to take out the bisulphide of carbon—the first taking out the carbonic acid, and the last being a catch vessel given to me by the form of valve used. It is the same as I described

at such points as might be thought best? He believed that were such a plan adopted, the examination of their water supply would be considerably facilitated.

A long discussion followed the reading of the paper, and eventually the motion was put to the meeting and carried by 20 votes to 3.

SANITARY INSTITUTE OF GREAT BRITAIN.

When commenting in the "Water and Sanitary Notes," in a recent number of the *Journal*, on a paper read at the Congress of the above-named Institute lately held in Exeter, reference was made to a communication by Mr. F. P. PERKINS, the City Analyst of Exeter, on "The Sanitary Condition of Wells in Exeter and the Neighbourhood." The paper in question was as follows:—

This is not the first time that the wells situated in or near Exeter have formed a theme for writing or discussion. In the "History of the South of Devon," an interesting account of many of the natural springs and wells of the neighbourhood, and in the "History of the Chelera in Exeter," by the same author, the closing of certain wells of the city, which at that time were considered impure, is mentioned. In other works, too, devoted to the history of the city, reference is made to the wells, and the importance of the subject—the maintenance in proper condition of the wells of the city. The aim of this paper is not so much to deal with their past history as to shew the connection existing, or which is frequently established, between the disease and fresh sewage was constantly percolating into the well. The next examples are from the village of Alphington, where the drinking water is far from being good. The analyses from a couple of wells situated very near each other, resemble each other closely—both shew a large proportion of nitrogen as nitrates and nitrites. I have been informed that these wells are not far from the Chelera, but at Topham the wells near the River Exe are extremely foul, but in higher situations there is good water. Cases of fever were not unfrequent in the lower regions, brought on, without doubt, by drinking the river impurities which had filtered through to the wells. Another analysis I made at Topham was that of a horrible specimen; the water contained so much salt as to taste of it.

Ceming nearer to Exeter, on the Topham Road, about half a mile from the city, there is Parker's Well, formerly in estimation as a holy well. Whether the small proportion of iron it contains did act beneficially on the pilgrim's sight, or whether it was merely the invigorating walk and the coolness of the water, is open to question. However, water that is so good in a favourable light. The water is as clear as crystal, and contains but few impurities past or present. Just below this well, and close to the river, is one which is rather notorious—a well from which it was proposed at one time to draw a supply for the city, and which has been stated to be artesian. The water had evidence been founded on close observation by Sir H. De la Beche; but the frequent disturbances of strata which have taken place in the neighbourhood of Exeter entirely preclude the idea of an arrangement favourable to the sinking of an artesian well. The boring is stated to be less than 100 feet deep, the supply constant, but that it is derived from a distant outcrop, and filters through the sandstone, is impossible. This statement is confirmed by the analysis, for water that had filtered through such a depth of sandstone could not contain such an amount of organic matter. It would have been almost entirely oxidized. Its bright and sparkling appearance is, therefore, for a well that has a deep datum, it is turbid, and has a tint of yellow. Much of it, doubtless, is river water that has found its way through natural crevices in the rock, and the organic matter shewn here as organic ammonia is the remains of Exeter sewage. In St. Leonard's are wells which have been spoiled by sewage. Both the organic ammonia and the chlorine shew the action of sewage in slight form, and are emitted from its use. There was a specimen of fair and water from the same district, and not 200 yards from the contaminated wells.

I now go towards Pennsylvania. At Egerton Park and at the terrace above good water is found, but at a villa under it is unfit for use, the drainage being defective. The Lion's Holt supply has long been known as superior. The well of St. Anne was formerly the supply of Exeter. In the "History of the Chelera in Exeter" is a note stating that "as early as 1221 this water was brought into the city from its present sources in the upper part of the parish of St. Sidwell, and delivered by a conduit erected in the centre of the High Street below the Quatrefoils." In 1346 he mentioned "the Chelera in Exeter," and the water was brought into the city. It proved to be a good, cool, pleasant water, shewing but little organic matter. Rather above this well, in Well Lane, just under York Buildings and close by the St. Sidwell's Churchyard, is a public well, which in days gone by was doubtless as pure as the fount of St. Anne, but it has lost its reputation, and is, as it is stated, "a well which is teeming with impurities, probably a solution of ancient prisonaries. In the high ground of Posole Road the water is naturally good, but traces of recent contamination having been discovered, the well was examined, and a dead cat was pulled out. At Heathcote Bridge, very close to the bridge leading to "the little village of East Wonford, is a spring, and the water is still good. The creek is also now nothing better than an open sewer, giving off its foul emanations, and poisoning the air of one of the most beautiful walks in the neighbourhood—viz., the Wenford Fields.

Of the city wells but little good can be said; the soil there is saturated with impurities, which find their way into the wells. "Beautiful water, and preferred to any other," is said of many a specimen which when analyzed proves to be a mass of corruption, and an inquiry it has generally been found that if there has not been fever the people using it are what is called "galling." No one of the old public wells within the city yet examined yields good water.

On the same occasion, "The Ventilation of Water-Mains" was selected by Mr. STURPHENSON as the subject of a short paper, of which the following is the substance:

The author presumed it would be conceded that, given a collection of good water in a tank or reservoir, it was equally pure whether it was

discharged into a constant service system or an intermittent one, and also that the dangers involved in an intermittent water supply had so far nothing to do with the water itself, only with the system, thanks to the imperfect details which were still permitted to be carried out, and the rival results of former faulty systems. The question was how to obviate these dangers if possible. The great danger of the intermittent system arose from the tendency of the system, where the supply was turned off, to produce in the water-mains and service-pipes a vacuum, the result being that they became rapidly filled by suction power, or rather the external pressure with a leakage of air and soakings from more or less impure sources. Were the mains and service-pipes and taps all good and efficient, were leakage would not be so dangerous, but unfortunately they were not. As it was, the risk was the absorption of foul gases into the water, rendering it a suitable fluid for the production of diarrhoea, enteritis, or fever. He would propose to combat this great danger of intermittent systems by ventilating the mains from above, and the venting of the mains at the head of the main valve at the junction with every house-pipe or other outlet. He would propose, at a point immediately below the cut-off cock, to introduce a ventilating-pipe, which could be led up the side of a house, or be fixed to a post at such a height and in such a position as to admit pure atmospheric air. The venting of the mains at the head of the main valve admit a free supply of fresh air to the system, the V-pipes, being full of water, would prevent the admission of any air or gas from houses or closets, or any other outlet of the water system. The ventilating-pipe without the V-pipes would not suffice, for when the water had run out the system was filled with air, thus, that of the outer atmosphere, there would be a backward current of air established, with the consequent risk of the inhalation of impure gases. A constant water supply was necessarily voted on account of the expense, so it remained for science to help "the powers that be" out of the difficulties which finance imposed upon them.

THE EDISON ELECTRIC LIGHT.

(FROM OUR AMERICAN CORRESPONDENT.)

The October number of the *North American Review* contains an article on "The Success of the Electric Light," by Thomas A. Edison. Mr. Edison opens his paper by commenting upon the impatience with which the public have been waiting to see his lamp in successful competition with gas, and says that though it is some months since the announcements were made in the papers that his lamp was perfected, that all obstacles in the way of planting gas lamps were removed, and the subdivision almost at infinitum, of the electric current was an accomplished fact, yet the public had not seen the fulfilment of these promises.

After noting the adverse criticism which men of science have passed upon his invention, and likening it to the opinion expressed by some eminent men when the subjects of steam navigation, telegraphy, &c., were broached, the writer goes on to state that his system of electric lighting has, in fact, been a success from the first, and the delays which have occurred are not attributable to any defects in the various apparatus, but have been occasioned by the great labour required in arranging the details, and establishing the system upon a commercial basis as a substitute for gas.

Mr. Edison next says that the generator and lamp which he first proposed to use, could have produced a cheaper light than that obtained from gas, and would have been as effective and as easily managed. The delay, however, which has been occasioned by the difficulty of the two lamps is due to the fact that the system has been taken advantage of to effect many modifications both of the lamp and of the generator. Though having previously asserted that the lamp had been a success from the first, the writer states, with amusing calmness, that the lamp has been completely transformed; that the external form—and in other respects—the character of the two lamps is entirely different, but that in the perfected lamp incandescent carbon is substituted for a platinum wire wound on a spool of zircon; thus a softer light is produced. It would seem that charred paper is no longer used to make the carbon leap, as Mr. Edison states, "It is prepared from the fibre of a cultivated species of bamboo from Japan, and is subjected to a process of heating, which has been found to be the best required form and carbonized; and a very tenacious leop is obtained, one well adapted to withstand such concussion as it would be subjected to in daily use. The life of a carbon lamp is placed at six months, allowing it to be in use five hours a day. The cost of the lamp is given at 50 cents." The use of the carbon lamp, as Mr. Edison states, is equal to that of ordinary gas-jet; it is also claimed to be a steadier and purer white light than that produced by gas. The writer states that the heat emitted is one-fifth of that occasioned by gaslight of equal illuminating power. "A sort of meter" indicates the amount of electricity passed into each house.

Having thus enumerated the improvements of his perfected lamp over its predecessors, and its advantages over gas, he states that dynamo machines have been substituted for magneto machines, and closes his description of the lamp by affirming that "the limit of economy, simplicity, and practicability has been reached."

As to the future, the writer states that the demonstration of the working of the system will probably take place at Menlo Park before the close of the year. Further, that preparations are being made for introducing the system of electric lighting in all the chief cities throughout the United States; the towns are being mapped out, and contracts made for the manufacture of the apparatus. As to the cost of the light, the writer states that he has supplied the inventor states that the figure will be so low as to make competition on the part of the gas companies impossible.

In conclusion, it is claimed that the companies will be able to make such a profit from the supply of electricity for power, as to cover the expense of running the stations during the lighting hours.

I have given you a brief résumé of Mr. Edison's article—a paper that resembles all that have hitherto emanated from Menlo Park, being rich in assertions, but devoid of figures. It is not necessary to comment on the article; let your readers take it at its value. Suffice it to say that it has not created any particular interest in this country, and that the Atlantic, nor even had any effect on the quotations of gas stock.

SALE OF SHARES IN THE BRIGHTON AND HOVE GAS COMPANY.—On Wednesday last, Messrs. Edwin Fox and Bousfield offered for sale by auction, at the Mart, Tokenhouse Yard, E.C., 50 fully paid 420 shares in the above Company. The shares were put up in lots, six of which were bought at the rate of 5s. 6d. per share, and some 12,948 meters were disposed of at 2s. 6d. per meter realized. The sale was £197 10s.

THE GAS SUPPLY OF NEW YORK.—The number of gas-mains in New York on June 30, 1880, was 23,394. The miles of gas-mains in the city on Dec. 31, 1879, were 860. There were used in the public buildings last year 13,787,860 cubic feet of gas, costing 26,122 dollars; the cost of lighting the public lamps in 1879 was £20,677 dollars. There are 12,948 meters in use, about 21,214 cubic feet of gas were made in 1879, in which year 654,818 tons of coal were carbonized.

FURTHER NOTES ON PETROLEUM SPIRIT AND ALLIED LIQUIDS.

By Mr. A. H. ALLEN.

[A Paper read before the Chemical Section of the British Association at Swansea.]

At the Sheffield meeting of the Association, I laid before this Section the results of some experiments for distinguishing commercial petroleum spirit, or "benzoline," from coal-tar naphtha, or benzene. I have since extended the experiments to the "shale naphtha," obtained as a secondary product of the manufacture of paraffin wax and burning oil from the bituminous shale of the south of Scotland.

In physical properties shale naphtha presents the closest resemblance

- | | | |
|---|--|-----------------|
| a. Leading constituents. | Petroleum Spirit.
Heptane, C_7H_{16} , and its homologues. | 0.490
55° C. |
| b. Sp. gr. of sample at 15° 5' C. | | 0.878 |
| c. Boiling-point of sample. | | 80° C. |
| d. Solvent action of the sample on coal-tar pitch. | Very slight solvent action. Liquid only coloured amber yellow, even after very prolonged contact. | |
| e. Behaviour of the sample on agitating with carbolic acid (coloured with one measure of fused crystals of absolute carbolic acid (Calver's No. 2). | No apparent solution. The liquids are not miscible. For further details of this reaction, see Allen's "Commercial Organic Analysis," Vol. I., p. 317.] | |

From this table it appears that while shale naphtha presents the closest resemblance to petroleum spirit as regards its specific gravity, boiling-point, and solvent action on pitch, it is sharply distinguished from it by its insolubility in carbolic acid, which it readily dissolves. Coal-tar naphtha, or benzene. The carbolic test is not applicable to mixtures of the various products, as in such cases the phenol passes readily into complete solution. In its limited solubility in rectified spirit, shale naphtha resembles petroleum spirit, and differs from benzene, which is miscible with alcohol in all proportions. As the carbolic acid test had shown a sharp distinction between the more volatile products from petroleum and those from bituminous shale, it appeared interesting to apply it to the burning oils obtained from different sources. The samples of burning oil compared were a specimen of American petroleum, or "kerosene," of 0.800 sp. gr., boiling at 166° C.; and one of shale oil, or "photogene," of 0.801 sp. gr., boiling at 179° C. Both samples required 16 or 17 volumes of methylated spirit for complete solution, and gave with coal-tar pitch light yellow liquids, having a greenish fluorescence. Carbolic acid, employed in the proportion already described, was found not to be miscible with either kind of oil in the cold, but the white product caused it gradually to assume a black colour, and at last a nearly black colour. This reaction was repeatedly obtained, but I am unable to say whether it is peculiar to the few specimens hitherto examined, or is a test which might be generally applied to distinguish petroleum kerosene from the similar product from shale.

As a friend engaged in the paraffin industry, and to whom I am indebted for much information and various samples of shale products, gave me the clue to the differences observed in the behaviour of shale oils and petroleum oils with reagents. The explanation lies in the fact that while the naphtha and burning oil obtained by the distillation of petroleum consist chiefly of hydrocarbons of the paraffin gas or paraffin series, having the general formula C_nH_{2n+2} , the similar products of the distillation of shale consist largely of hydrocarbons of the ethylene or olefine series, having the general formula C_nH_{2n} . This difference in composition is clearly indicated by the behaviour of the various liquids with fuming nitric acid and with bromine. Thus, while 100 measures of petroleum spirit, when treated with fuming nitric acid (sp. gr. 1.45), concentrated sulphuric acid, fuming sulphuric acid, and caustic soda, em-

Product.
Naphtha or spirit; sp. gr. about 0.700; boiling-point about 50° C.

Photogene, or burning oil; sp. gr. about 0.800; boiling-point about 160° C.

Lubricating oil.

Wax.

Solid paraffins, C_nH_{2n+2} .

REMARKABLE occurrences rarely come singly. Last week, says *Money* (a City financial paper), the greater part of the South London suburbs was in a state of terror for several days, through an unfounded rumour that a raging lion had escaped from a travelling menagerie, and was lurking upon the tracks of stray schoolboys, late postmen, female post-office clerks, and any other tempting morsels he might have the chance to devour. This week it is the irrepressible and horrible Stock Exchange bears, who for the third time have inaugurated the season of long nights by coming round with their white sheet on a pole, surrounded by a scooped-out turnip to represent one of the electric lights on Waterloo Bridge, and frightening all the nervous old ladies and timid old gentlemen into selling their gas shares for fear of a tremendous panic and fall that is sure to arrive in the City some day very shortly, and just when nobody is supposed to expect it. In other words, a combination is at work to make money out of those who are foolish enough to be alarmed or intimidated by mischievous rumours, as the "bears" succeeded in doing many instances in doing last autumn and the autumn before, notwithstanding the warnings that we, and the rest of the press who were not included in the fraternity, gave to our friends not to be led away by unscrupulous wreckers, who care not how many honest men are ruined by their dirty gains so long as they get them. In 1878 it was "Edison is coming! He has done the miracle! It's all up with gas and gas shares! Electricity in every room in your house as soon as he arrives, for all but nothing!" But the time came and went, and, as we predicted from the first, there was no Edison, and would not be until or somebody else had made the apparently insoluble problem of finding a metal that could withstand for hours together the wondrous consuming power of concentrated lightning. Last autumn we had another scare upon a milder scale, though it passed off with much less serious consequences; but from the frequent recurrence of concerted "bearing" operations of this and other equally groundless kinds, it seems evident that the division, and enough silly and misguided persons exist, to make the experiment more or less profitable. It may be so again to-day, though we would hope not, for there is not a whit more reason why the public should play into their hands and encourage them in their dishonest schemes now than there was two years ago. The attempted scare this time is to be founded simply upon the fact that the authorities are making arrangements for some trials of the light to be made in certain public

to petroleum spirit, both liquids being known in commerce by the same names and used for similar purposes. They are also usually stated to be identical in chemical composition, and hence I supposed that the reactions which I had found characteristic of petroleum spirit would be equally applicable to shale naphtha. Experiment has shown certain differences in the behaviour of the two liquids with reagents which point a much wider divergence in their chemical composition than is commonly suspected to exist.

The following table exhibits in a convenient form the physical characters of the volatile naphthas from petroleum, shale, and coal tar, together with the differences observed in their solvent action on coal-tar pitch and anhydrous crystallized carbolic acid:—

Petroleum Spirit.	Shale Naphtha.	Coal-Tar Naphtha and Benzol.
Heptylene, C_7H_{14} , and its homologues.	Heptylene, C_7H_{14} , and its homologues.	Benzene, C_6H_6 , and its homologues.
0.718 55° C.	0.718 55° C.	0.878 80° C.
Behaves similarly to petroleum spirit.	Behaves similarly to petroleum spirit.	Readily dissolves pitch, forming a deep brown solution.

The liquids form a homogeneous mixture.

The liquids form a homogeneous mixture.

employed successively, yield at least 75 measures of unchanged oil, shale naphtha on similar treatment leaves but 15 to 30 per cent. of paraffins. Similar differences are observable in the case of the burning oils, that in the petroleum yielding from 55 to 80 per cent. of paraffins, while in shale photogene the unchanged oil is only 35 to 40 per cent. Repetition of the experiment shows that the process is capable of yielding results agreeing within 2 or 3 per cent., and sometimes much closer.

The different susceptibility of petroleum and shale oils to the action of nitric acid is borne out by the difference in the facility with which they combine with bromine. The results obtained in this way are very remarkable, however, appear to be wholly destitute of this series of hydrocarbons. I am informed that while chrysene is produced largely by the distillation of shale, anthracene is met with in but very insignificant quantity, and naphthalene appears to be entirely absent. The lubricating oils produced from shale consist almost wholly of olefines, the paraffins of high boiling point being solid at ordinary temperatures, and hence they are separated in the form of paraffin wax.

In petroleum spirit I have repeatedly found traces of benzene and its homologues, as indicated by the production of aniline. Shale products, however, appear to be wholly destitute of this series of hydrocarbons. I am informed that while chrysene is produced largely by the distillation of shale, anthracene is met with in but very insignificant quantity, and naphthalene appears to be entirely absent. The lubricating oils produced from shale consist almost wholly of olefines, the paraffins of high boiling point being solid at ordinary temperatures, and hence they are separated in the form of paraffin wax.

The following table shows roughly the differences in chemical composition between commercial petroleum products and the bodies of similar physical characters obtained by the distillation of shale, as deduced from the action of nitric acid on the oil. In order that the results might be comparable with those obtained from copper, the same quantities of metal and oil were used—viz., a piece of polished iron exposing 8 square inches of surface, this being immersed in 500-grain measures of the oil under examination. The samples thus prepared were kept in glass dishes, and agitated daily during the whole of the exposure, which extended over 24 days. The appearances were then noted, and determinations of iron made in each by the colorimetric method, using potassium cyanide as the reagent:—

Petroleum.	Shale.*
At least 75 per cent. of hydrocarbons of the paraffin or marsh gas series, C_nH_{2n+2} . The remainder olefines, C_nH_{2n} , with distinct traces of benzene and its homologues.	At least 60 to 70 per cent. of hydrocarbons of the olefine or ethylene series, C_nH_{2n} . The remainder paraffins, C_nH_{2n+2} . No trace of benzene or its homologues.
55 to 80 per cent. of higher members of the paraffin series, C_nH_{2n+2} . The remainder chiefly olefines.	60 to 65 per cent. of higher members of the olefine series, C_nH_{2n} . The remainder paraffins C_nH_{2n+2} .
(?)	Almost wholly higher olefines, C_nH_{2n} , the paraffins of similar high boiling-point being solid. No naphthalene.
	Solid paraffins, C_nH_{2n+2} .

places where expense is altogether a secondary consideration to public efficiency and convenience, and where the constant flickering that has hitherto been found inseparable from the electric system of illumination will be of comparatively trifling importance. But there is nothing whatever in this to reduce the value of gas shares, which are a good and improving property, and any temporary depression that may be caused by exceptional substitutions of the electric light for gas in certain large buildings will be far more than compensated for by the increased demand for gas for cooking and lighting purposes for the many hundreds of new houses that are annually added to the Metropolis and all the principal cities and towns in the kingdom. For anything yet made known to the world the old impracticable difficulty with the electric light remains exactly as Sir Humphry Davy described and lamented it 75 years ago, and until that difficulty is got over, to listen to the mercenary and interested twaddle of the "bears" and their friends, and to act upon it at a sacrifice, is simply and unmitigatedly absurd.

THE GAS SUPPLY OF PRESTWICH.—At the meeting of the Prestwich Local Board, on Wednesday last—Mr. H. L. Leeseport in the chair—the Clerk reported that a requisition had been received by the Chairman asking him to convene a meeting of the owners and ratepayers of the district to consider the question of the price of gas supplied by the Radcliffe and Fillingham Gas Company, and whether it was desirable to procure a supply of gas from the local gas works. The Chairman, Mr. Leeseport, said to obtain a reduction in price, but had failed. Mr. Harding said under the altered circumstances of the price of coal it was only reasonable that some steps should be taken to secure a reduction in the price of gas or a fresh source of supply. The charge of the Radcliffe Company was 5s. per 1000 feet, whereas the Salford Corporation only charged 3s. 7d. per 1000 feet. On the motion of Mr. B. Hoape, seconded by Mr. J. G. Clayton, the Chairman was requested to call a meeting of owners and ratepayers in pursuance of the requisition, on the requisitionists giving security as to the payment of the expenses in accordance with the Public Health Act, 1875.

* Since this paper was written, I have found reason to question the accuracy of the quantities here given. But whatever be the true proportion of unsaturated hydrocarbons, they are present in far larger quantity in the shale than in the petroleum product.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The Executive Committee of the Exhibition of Lighting and Heating Apparatus, &c., have now completed their arrangements for instituting a complete series of tests on the merits of the various exhibits which have been entered for adjudication. There are no fewer than ten classes of exhibits in which the tests have been made, and consequently this number of Competitors and Jurors has been appointed; and at a meeting of the Executive Committee held on Friday, the reporters or convokers of the several Committees were selected. The following are the names of them—*I.* Electric Lighting Appliances—*Mr. J. T. Bottomley, F.R.S.E., University of Glasgow;* *II.* Gas Lighting Appliances—*Mr. W. Poulton;* *III.* Gas-Motors, Governors, &c.—*Mr. R. H. Brouncker, I.A. & V.;* *IV.* Cooking Appliances and Heating Appliances—*Mr. J. L. Bruce, Architect and Civil Engineer;* *V.* Gas-Engines and Air-Engines—*Mr. St. John V. Day, C.E.;* *VII.* Oil Gases, Secondary Products, &c.—*Mr. J. J. Coleman, C.E.;* *VIII.* Water Appliances—*Mr. James M. Gale, C.E.;* *IX.* Ventilation and Electric Appliances, &c.—*Mr. R. H. Brouncker, I.A. & V.;* *X.* Safety Lamps, Mining Appliances, Fire-Clay Goods, &c.—*Mr. Ralph Moore, H.M. Inspector of Mines.* In no case are the jurors more than six or fewer than three in each Committee. It is expected that there will be well-nigh 100 individual exhibits or collections of exhibits, on which the jurors will have to advise and report. Early with the view of eliminating applications in respect of only meritorious objects or collections, it was found advisable to institute a small entry fee—10s. for each motor, and 5s. for each other exhibit—an arrangement which exhibitors readily fell in with. It is most probable that the exhibition may be kept open for five days longer than the original intention, and that the closing day will be on Friday, the 30th of October, instead of Monday, the 25th. There are now no fewer than four electric lighting firms or companies showing in the exhibition, the latest to come on the ground being the Anglo-American Electric Lighting Company, with the Brush system of lighting, and electric motors and lamps, &c., which are being worked from one machine. On Friday and Saturday nights there was quite a flood of electric beams in that portion of the exhibition hall specially set apart for electric lighting.

Certain members of the Town Council of Glasgow, in addressing the electors at the polls which they represent, have, during the past week, referred to the gas question. One member of the Corporation Gas Committee told his constituents that the revenue of the Gas Commissioners during the past financial year amounted to £340,000, and the expenditure amounted to £257,000, showing a balance of £83,000, which was carried to reserve. The price of gas was reduced from 3s. 6d. to 3s. 3d. per 1000 cubic feet, and the speaker was hopeful that in the course of the ensuing year a further reduction in price would be made. The Gas Trust was in a most flourishing condition. Baillie Finlay, another member of the Gas Committee, went even further than that. After stating that the price of gas had been reduced from 3s. 6d. to 3s. 3d. per 1000 cubic feet within the past six years—equal to an annual saving of £105,000 to the community—he said that next Whitensunday there would probably be another drop of 2d. per 1000 cubic feet; when the Glasgow gas consumers would be burning the cheapest gas in the United Kingdom. The speaker had no doubt that the Corporation had made contributions to the works during the past six years the sum of £60,000, all of which was taken from revenue. He further pointed out the good quality of Glasgow gas—24 candles—and the fact that the Corporation supplied the meters free of charge and kept them in good repair; and he continued that the advantages which he had mentioned were equal to a reduction of 4d. per 1000 feet of gas. An Edinburgh paper hopes that Baillie Finlay's expectations will not be lost sight of at the approaching ward meetings in the "Modern Athens." Councillor Drow, also a member of the Gas Committee, told his constituents that there had been sold and accounted for by the Corporation 1,000,000 of gas in the preceding year; and he mentioned that the total value of the gas-works belonging to the Corporation was rather more than £1,000,000 sterling. There is a proposal also just now which aims at taking a sum of £5000 from the funds of the Gas Trust, and handing it over for the general purposes of the Corporation.

The new portion of the gas-works at Broughty Ferry having recently been completed, it was reported at the last meeting of the Police Commissioners that the works had been started on the 4th inst. The works having been assigned to an experienced workman, and the work going, and so far as could be tested in a short trial, was found satisfactory.

Edinburgh and Leith gas stock was sold last Thursday at £95 10s. per share; and on the following day the Aberdeen gas annuities were sold at from 46 s. 8d. to 56 s. 8d. per share.

A fair home trade is doing in Scotch pig iron, and the Continent is taking iron more freely in order to have it forwarded before the season closes. The market closed on Friday with buyers at 50s. 4½d. cash and 50s. 7d. one month, and sellers asking 1½d. higher per ton.

The coal trade is continuing to improve, and the price of gas coal is advancing.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

An improvement is certainly noticeable in the coal trade of this district, so far as round coals are concerned, but there is still no actual pressing demand in the market, and with the exception of a few extra trials they are able to raise quite sufficient coal to meet present requirements without interfering with stocks. Best Wigan Arley at the pit mouth is quoted at about 8s. to 8s. 6d., with lower qualities and good Pemberton for about 7s. 6d. to 7s. per ton.

In the gas coal trade there is very little actual buying going on, except where small quantities are required for private firms and mills; but there is an increased quantity now being delivered from the collieries on account of contracts, which has a tendency to give a firmer tone to prices where the inquiries are made. For good South Yorkshire district gas coal at the pit mouth the average price now would be about 3d. per ton. A fair quantity of gas coal is at present going away for shipment.

Common round coals for iron-making and general manufacturing purposes are more or less a drug in the market, and for these very low prices are being obtained, the quotations at the pit ranging from 4s. 9d. to 5s. 6d. per ton, according to quality.

Engine classes of fuel are in steady demand, and although there is now an increased production of slack, this has not yet had any material effect upon prices, which remain at about 3s. 9d. to 4s. 3d. per ton for burgy, and 3s. 6d. for good slack at the pit mouth.

For coke there is a moderately fair inquiry at late rates, which at the ovens remain at about 9s. to 12s. per ton, according to quality.

The iron trade has been extremely dull, and amongst some of the makers there has not been much disposition to quote until the result of the quarterly meeting has just been given ascertained. There is, however, generally a weakness in prices, with an absence of demand on the part of consumers, who are in want of very little iron, whilst those who have to come into the market only buy from hand to mouth.

Lancashire pig iron delivered into the Manchester district is nominally quoted at about 47s. 6d. for foundry, and 46s. 6d. for forge qualities, less 2½ per cent.; but makers are not firm holders at these figures. Bar iron delivered into the Manchester district is quoted at about 56 to 58 2s. 6d. per ton, but less money would be taken for prompt specifications.

The winter session of the Manchester Scientific and Mechanical Society was opened on Friday evening by a meeting at the Industrial Exhibition now being held at the Pomona Gardens, and Mr. C. Bailey, in noticing the gas exhibits, referred to the great development which had taken place in the application of gas to various purposes. He did not think they need anticipate that, for the present at least, gas would all suffer by the competition of the electric light, which was only suitable for lighthouses or for large spaces, and holders of gas shares need not have any fear on the score of their property being depreciated in value.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Though a slight improvement may be reported in the state of the coal trade in this district, yet things are dull, and but little animation is noticeable in comparison with what has been witnessed at this season of the year. A slight falling-off is reported in the demand for iron-making fuel, owing to a decline in the number of furnaces in blast, and to a check in the finished department. Prices remain the same as have been quoted for several weeks past, and, although no alterations have been made in any respect, increased rates are urged by the men with a view to higher profits, and an increase in miners wages. An increase is perceptible in the output of the Cannock blast-pits, and the shipping of this number is expected to be at least for several months. There is a fair call for gas coals, and most of the cheaper qualities of the neighbourhood. Coke is in better request at firm rates.

The iron trade has not as yet shown any material improvement since the alteration of the prices took place, but, on the contrary, remaining as in the case of the majority of the districts, for the depression has to some extent increased. The many inquiries made at the quarterly meetings appear only to have been made with the object of testing prices, for nothing of importance has transpired in connection with the finished iron trade. South Staffordshire brands of marked bars are now quoted at 10s. per ton all round, and all-true pig iron is likewise reduced 5s. per ton. Hot blast pigs are now quoted at £3 to £3 7s. 6d., and cold blast at £4 to £4 5s. Part mine is also cheaper, the average rate being £2 10s., while under pigs remain at £2.

But little business has been transacted on the £7 10s. basis for marked bars, rods, and plates are perhaps in demand. Rods and strips are more sought after at the reduced rates. The demand on foreign account is considered to be on the decline. This is especially the case in the American market, where a perceptible difference has taken place. As an increased demand is, however, reported from the Cape and a few of the other markets, it will not be serious. The demand for galvanized sheets is still good, and may be said to be the best feature in the export trade. Prices, too, are firm in all classes. A reduction is again to be reported in the number of blast furnaces at work in the district. During the last three weeks some half-dozen furnaces have either been damped or blown out, and the number of furnaces at work is now 42 in this number. This number, however, in excess by 20 of the numbers in blast in the corresponding period of last year. Heavy iron foundries, edge tool, and tube makers are fairly well employed.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Almost all branches of the finished iron trade remain quiet, although some of the works seem to be better off than they were a short time ago. Many of the foundries where ordinary castings are produced are doing but little work, and these produce a small quantity of castings, and apparatus belonging to the former branch, are fairly off for orders. There is about an average tonnage of pig iron produced and sold by the various firms engaged in the trade. Very little ironstone is sent out from the local pits, there being a large influx of ore from North Lincolnshire and Cleveland, and a smaller quantity from the West. The breakdown at the Yorkshire Steel and Iron Works, at Penistone, has been got over, and work resumed.

The steam coal trade is in a pretty good state, considering the period of the year arrived at. The tonnage sent to Goole and Hull from the West Yorkshire district has been small. Only about 14,000 tons have been sent to the Yorkshire district. The Hull trade is well sustained, and there is a fair tonnage forwarded to Grimsby, which port is easy of access to that part of the coal-field. Prices, however, do not increase, nor are they now likely to do so this season. A fair amount of smelting fuel is also being sent to Barrow and some other markets.

For ordinary coal the demand is only limited, or, in other words, the output is far in advance of the consumption. Some of the pits are said to have intimated their intention of advancing prices; but it is to be feared this movement will be with difficulty sustained, owing to the competition which has to be encountered. The demand for both Silkestone and Barrow thicken coal for London is only moderate, and the returns show that the Great Northern carried off only of the leading pits working the Silkestone seam only 11,000 tons, of which the Birley Colliery, near Sheffield, furnished nearly half. This was a falling-off when compared with the tonnage of the previous month, upwards of 13,000 tons being forwarded to the same place. Only about 14,000 tons have been sent from the thick-seam pits, and of this the Carlton Main Colliery furnished the largest tonnage. From the St. John's and New Sharlstone Collieries, in the West Yorkshire district, upwards of 8000 tons were sent. A fair tonnage was also placed on the Midland line by collieries on both sides of the coal-field.

Other kinds of fuel, including gas, locomotive, and manufacturing coal, are only in about average request. The contracts for the supply of all kinds of coal are easily executed, even although the pits are only working about three and four days per week. Considering the large output of coal there is a tolerable business passing. The owners of furnaces in North Lincolnshire and the Barrow districts are giving a good share of attention to the South Yorkshire coke, which, although not so good as that from the North of England, has of late been much improved, and in some instances has been freely used.

A good deal of interest is being taken in the affairs of the Silkestone and West Yorkshire miners agreed, through their Secretary, Mr. W. Pickard, to accept a reduction of 2½ per cent. during the next four months, according to the fifth clause of the sliding scale agreement; yet at the very time this was being done, the South Yorkshire miners delegates were met in a private meeting to discuss the desirability of demanding an advance of wages. The conference, however, turned out to be abortive, and the only resolution agreed upon was that a circular should be issued to the masters, asking them to advance the price of coal, and give the men an increased rate of wages.

The labour market is being taken in the affairs of the Silkestone and Dodworth Iron and Coal Company, Limited, and hopes are entertained that, inasmuch as they find employment for nearly 1000 men and boys,

the pits will be kept going. Mr. H. Hartley, the Manager of the firm, has been appointed provisional liquidator. It is satisfactory to state that the threatened dispute at the Hoyland Silkstone Collieries, where a large tonnage of capital gas coal is raised weekly, has been bridged over, the men agreeing to certain matters, as to an allowance for taking out the riddles, being submitted to arbitration. With regard to the Thorpe Gawber Hall Collieries, Limited, at a private meeting of the Shareholders, held last week in London, various suggestions were made to put the Company on a footing of working the pits, and in the meantime the collieries, which have been standing since the 29th of September, are still idle, although the make of coke is going on.

THE COAL AND GENERAL TRADES OF THE NORTH
OF ENGLAND.

OF ENGLAND.
(FROM OUR OWN CORRESPONDENT.)

The gas coal trade is busy. The shipments by steamers to London and coastwise have been a full average over the past fortnight, though the supply of tonnage has been rather short. Upon the whole the business going in coals in the North of England continues to get stronger all round. House coals are doing much better than they did. There has been a considerable clearing of the docks of fuel of late. The last fortnight. This upward movement of house coals will help second-class gas coals somewhat; but though trade is not so dead as it was a couple of months ago, the improvement is only comparative; and if anything like a steady business can be transacted this side of Christmas, without any undue advance in price, the gas companies will be well satisfied. In October, as gas and house coals come to the front, steam coals begin to occupy a secondary position. The price of steam coals has not been upheld. The shipments to the East Indies by large vessels were good last week, otherwise this trade would have been very moderate. The gas coal trade is plentiful and in fair demand, and the same may be said of coke.

The coasting market was not very well supplied with sailing tonnage last week. Freight rates are higher, but in no instance do they get beyond a rise of from 6d. to 1s. per ton upon the business transacted over the summer. Some small vessels continue to derive an advantage from return cargoes, which help the coal freight in many instances, especially when they can be had in the North of France. The shipments of gas cargoes to the Channel are pretty steady, but the tonnage taken up for Ireland last week was small. Gas coals are being sent off to the Baltic to complete the stocks for the winter, and some cargoes were shipped last week in steamers for the Mediterranean, mainly for the station gas companies.

Iron foundries, especially in the manufacture of heavy castings for marine engines, are moderately well employed. But though they quote low for other descriptions of work, they fail in securing many fresh orders. Prospects do not appear to be extremely favourable for the winter. A large concern or two at Middlesbrough are executing good orders for pipes; but, as a rule, the water and gas pipe trades are not very busy. In the general business of iron manufacture, prospects have been better than in the past, and there is more confidence in the future. Buyers have been anxious to purchase. This largely applies to plates and angles, and that description of work. Pig iron showed an advance of about 6d. per ton last week.

With the exception of soda, which has been sold in rather large parcels, at £3 2s. 6d. per ton net, the chemical trade of the North of England gives no manifestations of revival. Ash is low in price, and in poor demand, and the same may be said of the other articles offered for sale.

The fire-clay goods trade remains in a somewhat dull condition. This is especially so of second-class sorts. The large concerns are still completing their orders, and they do not complain of a lack of business; but less favoured establishments continue to add to stock. The deliveries of wood are moderate, but they are quite enough for the requirements of trade. A quiet—indeed, a dull business is transacted in lead. Copper, and iron, are not wanted in very large quantities at the moment.

Working men keep well employed in the North. Wages of all sorts of labourers are upheld.

PROPOSED PURCHASE OF THE BOURNEMOUTH GAS AND WATER WORKS BY THE LOCAL BOARD.—The Bournemouth Local Board have, it is stated, appointed a Committee to consider the desirability of purchasing the gas and water works in the town.

LLANELLY GAS COMPANY.—The half-yearly meeting of this Company was held on Friday last—Mr. W. Thomas in the chair. The Directors recommended a dividend at the rate of 5 per cent. per annum, and this was agreed to.

THE WATER SUPPLY OF EPPLEBY (YORKS).—A meeting of the ratepayers of Eppleby was held on Wednesday last to consider the desirability of bringing an additional supply of good water into the town. It appeared, from a statement made out by the Overseer, that 21 out of 63 houses were short of good water—a proof that this important commodity is wanted.

POLLUTION OF THE THAMES AT WOKINGHAM.—On Tuesday last summonses were heard before Mr. King (Chairman), Mr. J. Walter, M.P., and a full bench of Magistrates, at Wokingham, against the Wokingham Sanitary Authority, for polluting the Thames by permitting sewage to be discharged into the Kennet close to its mouth, and thence into the Thames, and for neglecting to take proper precautions to prevent such pollution. Mr. Payne represented the Thames Conservancy Board, and Mr. G. A. R. Fitzgerald (instructed by Mr. Wheeler, Clerk to the Wokingham Sanitary Authority) appeared for that body. The Magistrates held that the notice said to have been served on the Authority was bad, and dismissed the case, but, in so doing, remarked that they hoped the case would be taken to a higher tribunal.

LOCAL GOVERNMENT BOARD INQUIRY AT HINDLEY.—On Wednesday last, Major Tullough, one of the Inspectors of the Local Government Board, held an inquiry at Hindley with reference to an application by the Local Board for power to borrow £38,216 for works of street improvement, £6000 for gas purposes, and £1500 for works for the treatment of nightsoil. The Ratepayers Association opposed the borrowing of the money on the ground that the ratepayers would have to pay a rate of 1s. 6d. would entail a rate of 9d. in the pound. It was suggested that, in lieu of borrowing, an extra rate of 6d. in the pound per year should be laid to provide funds to carry out the proposed improvements. The Inspector said he did not agree with the suggestions of the Association, because it was not fair to saddle the present inhabitants with the cost of improvements which would be enjoyed by future inhabitants. He said that a portion of the amount required for gas purposes and street improvements had already been spent, and that the Board intended to construct works on the best principle for dealing with the refuse of the township.

THE SEWERAGE OF BRADFORD.—The Bradford Corporation having applied to the Local Government Board for sanction to borrow £30,000 for works of sewerage, and £40,000 for providing for the purification of the town refuse, an inquiry into the subject of the application was held at the Town Hall, Bradford, on Thursday last, by Mr. R. Morgan, C.E., one

The Inspectors were the Local Government Board. The Town Clerk (Mr. W. T. McGowan), the Borough Surveyor (Mr. J. H. Cox), and Mr. C. Gott were present on behalf of the Corporation. The Town Clerk explained the system of the sewage works, which, he said, had been inspected by a great many local authorities, who were very flattering in the opinion they expressed upon it. By the system adopted the waters were thoroughly and completely purified. The Corporation had been asked for a loan of £200,000 applied for had already been formed, but others, for which the borrowing of money had been sanctioned, had not been completed. The total amount already borrowed for sewerage was £200,000. Of this sum £20,000 was borrowed in 1876. The Inspector drew attention to the fact that while the Corporation had been asked for a loan of £200,000, the loan required for. At the suggestion of the Town Clerk, the amount of the loan required was altered to £32,000. The Town Clerk then referred to the question of the purification of the town refuse. For this purpose the Corporation asked for £40,000. They had chosen two suitable sites, but they had no funds to carry out the work, and the Inspectors said that the loan applied for was £20,000 and for the balance of £20,000, the proceedings, which were of a purely formal character, terminated.

THE WATER SUPPLY OF EXETER.—During the recent Congress of the Sanitary Institute in Exeter, Dr. Bartlett, in a lecture to working men, referred to the probable effects tainted river water from below Tiverton might have on the water-drinking inhabitants of Exeter, in the event of a failure of the *Exeter Waterworks*. He then made a very concise communication on the subject from “one of the most eminent members of the Sanitary Congress, of greater experience and authority than Dr. Bartlett, or any other sanitarian, with respect to the water question.” The speaker, who followed, said that water may be worth more than a ton of speculation. That which happened in Exeter was most instructive to Exeter. During a raging cholera epidemic in Bilston, Staffordshire, where about one-tenth of the population died, the excreta was thrown on to the surface, or into drains, which washed down into the River Trent, and thence into the River Mersey, and thence into the River Black Country above Birmingham, and where cholera also prevailed. The supply of water for Birmingham was, without filtration, pumped from water impounded from the Tame, but no case of cholera occurred. The water of the River Trent was filtered, and cholera occurred. The Exeter people should, nevertheless, compel Tiverton to clarify all the sewage, and the Exeter Town Council should also deal with their sewage, so as not to be a nuisance to the citizens of Exeter, or to any one else below. River water would be fit for drinking, and should be so used, and the sewage should be filtered on all conditions, and no filter should pass but covered service reservoirs, then direct to the water-mains, and from these, by service-pipes, to every house and single room, it was used, as a teneament. The river water will be the best, because it will be the purest, and the best supply, and may be satisfactorily filtered so as to be clean, clear, and wholesome.

IMPROVEMENT IN STREET LIGHTING AT SOUTHAMPTON—Last Saturday's *Southampton Times* says: "Those of our readers who on Thursday or Friday evenings last passed through the main thoroughfare at the upper part of the town could not fail to have been struck with the largely increased number of lamps and burners which have been recently fixed to the lamp columns in that vicinity. These new burners, together with the handsome lanterns enclosing them, have been fixed at the expense of the Southampton Gas Company, and under the direction of their Manager, Mr. J. W. G. Smith, have been fixed to the lamp columns at the junction of the main thoroughfare with the New Road, and at the junction of the New Road with the Commercial and New Roads with the main thoroughfare, and the six smaller burners in the intervening and adjacent spaces. We understand that this experiment was commenced in the early part of the year 1879, to afford practical proof of the efficiency of gas lighting for the illumination of large open spaces and of localities where no auxiliary aid can be derived from buildings. The results have been so successful that the Company are not so powerful as the large Argand previously fixed at the end of the Commercial Road, and which is now used by the Dock Company to light that part of their premises where the business connected with the Commercial Dock is transacted, that they have determined to extend the improvement upon our ordinary mode of street lighting."

STOCKTON AND MIDDLESBROUGH CORPORATION WATER SUPPLY.—A correspondent of the Newcastle Chronicle writes: "As the period draws nigh for parliamentary notices, the position of the water supply of the Stockton and Middlesbrough district becomes more interesting. It is yet doubtful whether the Water Board will be allowed to go to Parliament for a Bill to increase the quantity of water pumped from the Tees, which that Board acquired the works and undertaking of the old Water Company was not less than £27,000; that the cost of the arbitration define the value was £10,000; and that in addition a stamp duty was paid of £3400; so that with so heavy a cost it is scarcely probable that the Board will be allowed to increase the quantity of water pumped, without a contest. But something needs to be done. There is still the same objection to the source of supply of the water. Its purity is at least open to question, and it is certain that water pumped from the Tees by water supplied by a much less economical method than that which is supplied by the Tees, is not only more expensive, but also more liable to disease. Immense works, but with the heavy loss on the carrying on of the works, even after a large increase in the rates, it is exceedingly improbable that these works will be carried out in their entirety. Meantime the demand for water is increasing, in the old limits of the Board, and in that portion which the Board have acquired. The quantity of water pumped was about 60 million gallons weekly—or about 10 million gallons less than the maximum quantity. The exact figures for the current year have not been allowed to transpire, but it was stated in April 2 million gallons weekly more were drawn than in the previous year. The quantity of water drawn in the district, in the consumption at iron-works since then, and the population has grown, so that it may be assumed that the margin between the quantity drawn and the maximum that may be drawn is small now. Hence the Water Board needs to face the question how to meet that growth in the demand, that the Board have acquired. If the Board are allowed to increase the supply, it will increase that maximum, and as Darlington also draws its supply from the same source, it would be unadvisable in the interests of the river. Hence that simple, if objectionable, method of meeting the difficulty is out of the question; and as the ratepayers are unlikely to allow the immense increase in the rates, which would be necessary to meet the increased liability of the present loss on the supply being done away with, the Board will be in a dilemma between the wants of its customers and its statutory powers. Probably it will have early to undertake some of the smallest of its meditated reservoirs, so as to increase its supply and thereby diminish the burden that ratepayers have to bear."

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TO CORRESPONDENTS.

- H. S. G.—Will procure the information for which you ask. See "Trade Notes from Scotland" this week.
- A. E.—Your letter, being a bare re-iteration of the former one which was published, has been received.
- T. F.—We are not clear as to the points of divergence between the burner received and others of similar construction. Will you kindly point out the grounds of novelty upon which you desire our opinion.
- J. R. A.—We would advise you to weigh your coal and coke, and shall be glad to hear further from you when you have arrived at more definite results respecting the working of your furnace as compared with the old system.
- RECEIVED.—"The Plumber, and Sanitary Houses: A Practical Treatise on the Principles of Internal Plumbing Work, or the Best Means for Effectually excluding Noxious Gases from our Houses," By S. Stevens Hellyer. Second Edition. London, B. T. Batford; 1880.
- No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 26, 1880.

Circular to Gas Companies.

THE expected Stock Exchange operations on gas stock, accompanying the renewed assurances that electric lighting is shortly to commence its universal reign, have been commenced, but without much prospect of equal success to that which attended the general "bearing" campaign of two years ago. A financial contemporary notices the recent fall in the value of a leading Gas Company's stock, followed immediately by a steady and irrepressible recovery, as a sign that, however vigorously the operators for the fall may have assailed the market, there has been no possibility of forcing on the partial panic, or, at least, permanent depres-

sion, which they sought to bring about, to their own advantage and the distress of the holders of gas shares. If the authority in question is correct in this assumption, the discomfiture of a gambling gang is a fit subject for congratulation among every one interested in the preservation of the stability of investments in joint-stock enterprises. We cannot expect that gas property will be more exempt than any other from occasional raids of unprincipled speculators, especially as it has grown of late years into such importance as to have assumed an international interest, the general fluctuations in value of the gas stock in one country being repeated all over the globe. It was permissible to hope that as the price of gas shares in the New York market remained quite unaffected by the recent announcements emanating from Mr. Edison, no more effect would be producible from the same cause in England, and this feeling of confidence has, on the whole, been amply justified. There has been no widespread depreciation in Metropolitan or other gas stock, and the particular instance taken by our contemporary for the text of a homily on the folly of attempting to wreck Gas Companies, may, on the face of it, be due to special causes. Still, the fact of speculators having a covetous eye on the high premiums at which gas shares ordinarily stand, and the certainty that no opportunity of snatching a profit in connection with sudden and violent fluctuations in the value of this class of securities will be overlooked, is sufficient to induce vigilance on the part of those who are equally interested in maintaining them at their normal value. This can, of course, only be done by facing, as it arises, every fresh cause of possible disquietude in the minds of timid Proprietors, and taking care that persons interested on one side do not have all their own way. All gas engineers and responsible officials connected with public or private gas undertakings, must be careful to inform themselves clearly and fairly respecting any new form of electric lighting or other avowed enemy of gas, great or small, in order that they may be at all times ready to correct the garbled accounts and glaring misstatements which are rife whenever public attention is directed to anything new, or professedly new, of the kind. And it should always be remembered that nothing of this nature, however insignificant, can be safely "pool-pooled" by those who can or ought to be able to dispose of it by convincing argument. The ignorance of the general public on technical matters is profound, and commensurate with this ignorance is the liability to take alarm at shadows not less than at the most portentous realities—the proneness to believe in the solidity of any sham, at least for a time, especially if the fabric of the imposture be principally newspapers. The staleness of an illusion is no guarantee that it will fail to impose on some few people each time it is paraded. It may be that a much-lauded electric lamp is a revival under a new name of some long-forgotten device; or it may even be a startling proposal to make gas out of sewage, or of old bones. All such schemes are in their nature perennial, and are no sooner cut down than they reappear, always to find some fresh believers, and always to be met with the same condemnation. It is due to the interest of the community no less than to their own credit, that gas men should be able to demolish old fallacies in the matter of artificial illumination, and detect the weak points of new ones. And besides the duty of dealing with individual and definite causes of disturbance such as we have indicated, the general confidence of gas Proprietors in their investments is by all means to be maintained by instructing them, whenever occasion serves, in the nature and possibilities of gas in all its ramifications, so that whenever a few street-lamps are lit up by electricity the risk of a panic, or the inward perturbation which leads to a panic, and which is essentially a result of ignorance, may be much diminished, if not altogether removed.

On Thursday last, at Newcastle, a most interesting lecture on electric lighting was delivered by Mr. J. W. Swan, who is Mr. T. A. Edison's rival in the production of a light from incandescent carbon *in vacuo*. We shall give an abstract of the lecture on an early date, and our readers will then be enabled to trace the extraordinary resemblance between the proceedings of the two inventors, carried on, of course, in perfect independence of each other. Mr. Swan has slightly the priority in point of date, and therefore it cannot be said that the unintentional copying belongs to the worker on this side of the Atlantic. This is so far satisfactory, as preventing an otherwise inevitable controversy. No one here is likely to indulge in hard words at Mr. Edison's expense; but it is not so certain that the friends of the latter gentleman would refrain from all imputations against Mr. Swan if caught imitating the Menlo Park luminary. What may be

the true value of either the Swan or the Edison lamp can only be determined by experience, and the sanguine statements of neither inventor are likely to be accepted without further proof of a convincing kind. It is noteworthy that Mr. Swan does not desire the total extinction of gas, even while preparing for it. He, unlike Mr. Edison, sees that the introduction of a new light into the world does not necessarily imply the abolition of any previously known light, unless it be notoriously inefficient, and that is a reservation which certainly cannot be held to apply to gas.

One of the paramount advantages to be conferred by electric lighting, when generally adopted, is to be the complete immunity from the loss of life and property by fire and explosion, which is such an objectionable accompaniment to the use of gas. Such, at least, is the contention of the prophets of the new luminary. How far this dazzling promise is likely to be fulfilled we are slowly learning by the dispassionate testimony of facts. In February of the present year we had occasion to notice the death of a bandsman at Aston, near Birmingham, by an electric shock, stated to have been the consequence of his grasping the connecting wire of an electric lamp while the current was passing. Another victim has now lost his life by the imprudence of touching an electric lamp with both hands. This time the "accident" happened at sea, on board the *Livadia*, the new yacht of the Emperor of Russia, on her passage from the Clyde to Brest. It appears that a stoker was told to hold an electric lamp while it was being swung for lighting the stove-hole. He obeyed, but in such a manner as to divert the current from the carbons through his own body, and he was instantly struck dead, as by lightning, the disintegration of the animal tissues by the current being such as to render it necessary to bury the body at sea within twenty-four hours from death. The daily papers remark on the impressive nature of the funeral service; but to us and to the public generally the most impressive thing about the melancholy occurrence is the confirmation it affords of the previously recorded fact, that the incautious handling of an electric lamp may result in death of the awful character always attached in the popular mind to a lightning stroke. Death has often occurred in the past, and may at any time happen to persons who are exposed, by their own act or by the acts of others, to the effects of an explosion of gas, or of suffocation by an escape of gas unattended with any explosion; but great recklessness or ignorance must in such cases be exhibited by somebody, and in most instances of the kind there is sufficient warning given to be appreciated by sensible people. In the case of an apparatus which places portable lightning within the reach of an unskilled man who is only doing his duty in holding it, the utter absence of any intimation of the deadly power lying in ambush must be held sufficient to justify the proscription of any apparatus which is not so constructed as to render quite impossible such an accident as that on board the *Livadia*.

The report of the Gas Committee of the Manchester City Council, recommending a reduction of twopence per thousand cubic feet in the price of gas, has been adopted without opposition, and practically without debate; at least, within the Council. Outsiders are not quite so unanimous on the point of the sufficiency of the reduction some discontented consumers arguing that it ought to have been at least a shilling instead of the small sum named, and we confess to sympathy with the minority. Alderman Lamb, the Chairman of the Gas Committee, in moving the adoption of the report, appears to have indulged in disparaging remarks on the quality of the gas supplied to Leeds, and to have blinked the true reason for the disparity of the prices charged in the two places, by implying that gas of no better quality than that of Leeds might be supplied as cheaply in Manchester, if the consumers in the latter place would be content therewith. Now this, as the Alderman very well knew, was only half stating the question. If the gas consumers of Manchester were only charged for gas, and not for the improvements of the city also, they might still have gas of the quality to which they have been accustomed, yet as cheap as that of the Yorkshire town, whose very name appears to stink in the nostrils of Local Government Authorities who do not conduct their business upon sound principles. It should be a cause for congratulation to the Manchester Corporation that they could supply gas not only as cheaply, but for bulk, as the Leeds or any other public or private gas undertaking, but even much cheaper, valued on the basis of illuminating power. Advantage should certainly not be taken of this power to draw misleading comparisons, and to endeavour to divert to the distinctions of management, which are generally

the growth of local circumstances, considerations which truly apply to the principles of administration, and therefore hold good universally.

The British Gaslight Company must have been fully convinced for some time that their Norwich business is not the least troublesome of all the scattered tributaries to their income; but if they did not feel this before, recent events in that ancient city would suffice to create such an impression. A certain ingenious member in the Norwich Town Council has thought fit to constitute himself censor of the local undertaking belonging to the Company, and some utterances which this gentleman has lately made in his self-constituted office certainly transcend any ordinary criticism. Armed with two statements of accounts furnished by the Company for two successive half-yearly periods—one in accordance with their own system, and the other in the form prescribed by the Act of 1871—he has indulged in some astounding comparisons of the two balance-sheets, elucidating doubtful points, and supplying what he considers omissions, by data drawn from outside sources. The results thus arrived at were announced by him in a speech at a recent meeting of the Council, which earned the honour of a special vote of thanks, and is, perhaps, considered by his friends worthy of being transcribed in letters of gold, and treasured up for ever in the city archives. Opinions may differ as to the value of *ex parte* statements of this kind, and it is impossible for an impartial reader to place implicit confidence in assertions bearing in every line such evidence of strong prejudice as the speech in question. Its general purport may be gathered from the single fact that it swells the profit of £3728 for one half year's working, acknowledged by the Company, into an estimated profit of £12,603. Part of this is made up from the second working statement supplied by the Company, and the remainder is compiled from an alleged illegal charge for depreciation, an excess charged for coke used as fuel, deficiencies in the amounts received for tar and ammoniacal liquor sold, and an excess in the charge for carbonizing. The most unpleasant thing in connection with these matters of working detail is the tacit assumption on the part of the Company's critic that they are not truly represented in the accounts supplied—that, in point of fact, the Directors of the Company have been guilty of fabricating a false statement, and thus eking out wasteful management with positive fraud, entirely for the purpose of hoodwinking the people of Norwich. This is a very grave accusation to be made by any man in the sanctum of a Municipal Council chamber, and lands the accuser in a palpable dilemma. If he can get his allegations sustained, he must proceed to bring the delinquents on their knees, in doing which several negatives will have to be proved; or he must lie under the reproach of having overstated his case, and probably find that in consequence he has ruined a good *prima facie* claim. As the matter now stands, the immediate effect of the indictment is only the appointment of an Auditor charged with the clearing up the charges now made, by an impartial and trustworthy examination of the Company's books. When this has been done, we shall have firmer grounds than are at present available for determining what wrong, if any, has been committed, and by whom.

The Bench of Justices sitting in Quarter Sessions for East Kent, on Tuesday last, had a difficult case before them in an appeal by the Sheppy Gas Company against the rating of their works and plant, upon a new valuation by the Sheppy Board of Guardians. From £622 10s., the amount of the assessment fixed in 1872, the valuation has been raised by the authority in question to £1496, and this sudden increase of their liabilities was very naturally resented by the Gas Company, who offered to submit to an advance to £1000 in their gross annual value, in order to save an appeal; but this proposal being rejected by the Guardians, the case went to the Justices for decision. The Company contended that the amount of their assessment as it has stood since 1872, when their profits were about £2000, could not be fairly raised two and a half times after an interval which had only seen their profits increased to £2500. But the Guardians objected to their former valuation being taken as a precedent, and acknowledged having made an error in fixing the assessment so low; this error they now sought to correct. The Company further endeavoured, while accepting the principle of assessment known as the value of the concern to a hypothetical tenant, to prove that the allowances which such a person would require to be made from gross returns, before the net value of their business could be arrived at, must be rated considerably higher than usual, in consequence of the unsatisfactory

condition of the larger plant. There were other difficulties to be overcome in fixing the precise financial position of the same imaginary personage, having reference to the amount of floating capital he would require in order to carry on the concern. As explained by Mr. Michael, Q.C., the leading Counsel for the Company, the tenant would, as a matter of course, be allowed deductions of five per cent. for interest on his capital, ten per cent. for profits, and two and a half per cent. for risk of capital. Thus, supposing the amount of tenant's capital to be determined satisfactorily in this particular case, from seventeen to eighteen per cent. would have to be allowed upon it. But as far as the appeal proceeded, it was evident that the real point of divergence between the parties lay in the proportionate charge to be allowed for maintenance of the works and plant. If an average life of forty years were to be taken as the basis of computation, a charge of 2-4 per cent. would be sufficient, according to Counsel, to keep the works in a state of proper repair. But he proceeded to urge that instead of forty years, the life of the Sheppy Company's plant could only be equitably stated at twenty years, involving a charge of 8 per cent., in consequence of the inefficient construction thereof, and the insecure foundation which the site of the works—an alluvial deposit merely—offers for buildings of any kind. This sweeping deduction was not agreed to on the other side, and the question of repairs and expenditure was being hotly debated when a reference of the whole matter to a skilled arbitrator was accepted by both parties, to the evident relief of the Bench, who, by the Chairman, had repeatedly expressed their disinclination to wade through the masses of figures which would have to be brought before them if they had to hear the whole case. There are one or two points of interest in this matter which, when thoroughly gone into before an expert, will be worthy of careful consideration by those who may at any time be placed in the predicament of the Sheppy Gas Company. Without attempting to express an opinion on the question at issue, we may be allowed to hope that the reasons for such a remarkable increase in rating, if maintained, may at least be thoroughly well sifted.

The seventeenth half-yearly meeting of the West of Scotland Association of Gas Managers recently held at Port-Glasgow was up to the average of interest. The address of the President, Mr. R. S. Carlow, will be found in another column, and is a thoughtful commentary on some of the principal topics of interest to gas managers, although containing little matter of novel character. Mr. Carlow is apparently not very favourably disposed towards the steam stoking machinery at present in use for supplanting hand labour, chiefly on the score of the necessary rigidity in the design of settings to be worked thereby. He wishes to see brought out a machine of universal adaptability; and so do a great many others. It may be doubted, however, whether any works where settings of threes and fours are in vogue will ever benefit much by stoking machinery. Mr. Carlow also draws a comparison, unfavourable to Scottish gas undertakings, between their small encouragement of gas for the purposes of cooking and heating, and the proceedings of some English towns in the same direction. There is, of course, much room for improvement in this respect on both sides of the Border; but we hope that, with their facilities, North British towns will soon recover the way which, according to Mr. Carlow, they have at present lost.

A quarterly meeting of the Midland Association of Gas Managers was held at Birmingham on Friday last, Mr. P. Simpson, of Rugby, President of the Association, in the chair. Several subjects of much interest were discussed at the meeting, upon papers read by Mr. Hunt, of Birmingham, Mr. G. E. Stevenson, of Peterborough, and Mr. H. Woodall, of Leeds. Mr. Hunt reported the result of careful experiments he had made as to the comparative diffusive powers possessed by circular and square lanterns, the advantages being in favour of the former shape. Mr. Stevenson dealt with the manufacture of sulphate of ammonia, and Mr. Woodall raised the question of the necessity of charging meter-rents, which he was disposed to favour; but was not followed by Mr. Hunt, or the majority of the members present. The members afterwards visited the new works of the West Bromwich Improvement Commissioners.

TO OUR SCOTCH READERS.—Arrangements have now been completed by which Mr. John Allan, of No. 1, Roseneath Terrace, Edinburgh, will represent the Journal as our Correspondent for the North and East of Scotland; and we will thank gas managers and others in those parts to send early intimation to him in future of any matters likely to interest the gas profession at large.

Water and Sanitary Notes.

THE Vestry Delegates have once more assembled, under a deep conviction that the Government cannot manage the Water Question without their help. They want to know what the Government intend to do, and what part of the work is to be done by the Vestries. The Government, we apprehend, intend to do very little, so far as the next session is concerned, and the help of the Vestries will not be particularly wanted. It seems to us that the Delegates wish to travel rather faster than the Home Office. Mr. James Beal ought to understand these matters, but even he seems somewhat possessed with the notion that the Government are going at once to introduce a Bill which will transfer the Metropolis Water Supply to "some public body representing the interests of the consumers." We are aware that the report of the Select Committee of last session is somewhat contradictory on this point, and is therefore hard to be understood; but there are certain passages in it that seem clearly to contemplate the creation of a representative body which shall, in the first instance, consider whether or not there is to be a radical change in the present system of supplying London with water. To this so-called "Authority" will be deputed all those important questions relative to the water supply which people imagined would be settled by the Select Committee of last session, and which the Delegates seem to think were actually so dealt with. But only the fringe of the subject has yet been touched. We are told by one of the morning papers, that "anything less than the creation of the Water Authority, fairly representing the ratepayers, will not be tolerated by the inhabitants of London." There may be nothing less, and there may be nothing more. Sir William Harcourt is only pledged to that which is contained in the report of the Select Committee, and in that report it is recommended that the Water Authority "should be entrusted with the largest discretion as to the best method of dealing with the Water Supply of the Metropolis." It it added: "Various courses might be adopted," and first among these is specified the "regulation" of the powers of the existing Companies, "as in the case of the gas supply." The Water Authority having considered the various modes of proceeding, "further statutory authority would be necessary" to give effect to their conclusions, "so that the judgment of Parliament on any scheme adopted by the Water Authority would be finally reserved." If the recommendations of the Select Committee—which are really those of Sir W. Harcourt—are to be adhered to, we cannot see how the eager expectations of the Delegates are to be realized.

Dr. Dixon, the Medical Officer of Health for Bermondsey, has been drawing the attention of his Vestry to the real meaning of certain passages in Dr. Frankland's report on the Metropolis Water Supply for September. Dr. Frankland excepts the water of the Chelsea Company from the condemnation which he pronounces on the water supplied from the Thames by other Companies, the latter being pronounced "unfit for dietetic purposes, owing to the large quantity of organic matter which it contained." It would appear that from the Thames proceeds both bitter water and sweet, four Companies giving unwholesome water from that source, while against a fifth nothing can be said. The difference, as Dr. Dixon points out, is one of quantity in respect to the organic matter, and this difference he shows amounts to little more than a grain, or "about the weight of a large pin's head" in ten gallons of water. Dr. Dixon admits that there are certain circumstances under which even this very minute difference might be of great importance; "but," he says, "I have no reason to think it is so in the present instance." The minuteness of the quantities concerned is shown by the calculation that a man drinking water from the Southwark Company's mains at the rate of a quart a day, must persevere in the process for twenty-one years before he will have consumed one troy ounce of organic carbon, and he must drink on at this rate for 130 years in order to swallow an ounce of organic nitrogen. Of course the mischief is neither in the carbon nor the nitrogen, but in that which may accompany them. At the same time the quantity of these elements, when they are known to proceed from an organic source, is a measure of the peril; and with the index at so low a point, we may infer that the danger is itself infinitesimal. The great evil, as remarked by Dr. Dixon, consists in the pollution which often arises from the neglected condition of the cisterns where the water supply is intermittent.

The Nottingham Corporation may be congratulated on the possession of a well-contrived sewage farm, which, although

not to be looked upon as a source of revenue, affords a satisfactory method for the prevention of a serious and costly nuisance. The land consists of 638 acres on a subsoil of gravel. To this area the sewage of the upper part of Nottingham is conveyed by gravitation, but pumping will be requisite to raise the sewage of the lower portions of the town. The outfall sewer communicating with the farm has been constructed at a cost of £35,000, and passes through the Colwick Hills by means of a tunnel two miles long. At the farm about five miles of main carriers have been constructed of concrete, and from these subsidiary carriers will distribute the sewage over the land for the cultivation of the various crops. About 350 acres of land are now laid out for the reception of sewage, and will be adequate to deal with all that proceeds from the high level. It is calculated that the entire area is capable of receiving the sewage from a population at least double that of Nottingham at the present time, and it is expected that the farm will prove adequate for the next seventy or eighty years. About £70,000 has already been expended in connection with the farm, including the outfall works, and it is reckoned that about £30,000 more will be required, which is the exact amount of the estimate originally prepared by the Engineer of the Nottingham Corporation, Mr. M. Ogle Tarbotton. It is believed the annual loss to the borough will not exceed a rate of twopence or threepence in the pound. At a recent visit paid to the farm by the members of the Town Council, much satisfaction was expressed at the appearance of the undertaking, and great credit was given to the Borough Engineer for the manner in which the enterprise was being carried out. The notions once prevalent as to the creation of a profit out of sewage are now abandoned, and Nottingham is thankful for the prospect of losing no more than will be defrayed by a threepenny rate, while certain other towns have to pay nearly twice as much for a less perfect system.

The sanitary requirements of cities have given rise to the invention of a "destructor," consisting of a specially contrived furnace, in which everything which is to be got rid of is speedily consumed. One of these contrivances is in operation at Jarro, and the heat generated is so great that it is said to "burn a piece of iron an inch and a half square to "nothing in half an hour." Donkeys, it appears, are harder than iron, for it takes at least four hours to get rid of the carcase of one of these obstinate animals. As a donkey is considerably bigger than the iron cube, perhaps that may account for the difference; yet not wholly so, for a horse, which is bigger than a donkey, disappears in an hour, as also a cow. A pig is gone in a few minutes. Of course, the carcases of horses, cows, pigs, and donkeys are not consumed without special reasons. But articles of the most varied nature find their way to the "destructor." Among these are old beds, boots, and broken-down furniture, as well as defunct cats and dogs. One result of the general combustion is the production of clinkers, which are ground in a mill with lime, producing a species of mortar, or cement, which sells readily at 5s. per ton. The engine which grinds the clinkers has no need of coals to raise steam, the surplus heat of the furnace being more than sufficient for that purpose. The works at Jarro cost between £4000 and £5000, and the outlay is considered advantageous in its results. A similar contrivance exists at Leeds and elsewhere. A gentleman at Nottingham is the inventor and patentee, and his name is not inappropriately Mr. Fryer.

We learn that the office of Borough Accountant at Bradford is to be filled by Mr. Frederick Sandell, son of Mr. Edward Sandell, of Great George Street, Westminster.

Our commercial contemporary, *Money*, from whom we quoted last week, has the following, headed "Vicissitudes of Gas 'Bears'":—"The operator" for a fall in gas stocks, of whose probable movements we lately offered a premonitory hint, have suffered a slight calamity during the last few days, the sharpness of which is not alleviated by the consciousness of its retributive character. They tried very hard to reduce the value of honest men's property, and like many other naughty boys who have played with the gas, they have considerably burned their mischievous fingers. Unfortunately for their good intentions, they began their work at the wrong moment, as instead of the fall they had hoped for, there has been a rise of somewhere about £7 per £100 stock, with every indication of a further increase, and the poor "bears" had to go home with their ears somewhat sore than when they started. The usual preliminary article from Mr. Edison appeared in a recent number of the *North American Review*, and has been reproduced in the *London Globe*, stating that Edison's system of electrical lighting was from the first all that it was originally claimed to be. . . . The public have learned to become familiar with the assurances of this sanguine and enthusiastic inventor, and we shall, probably, have some more of his startling but totally unverified statements shortly, especially should the "bears" find it impossible to buy back what they have sold, in which case sensational telegrams from "America" will, no doubt, be used as a lever with which to force timid investors into parting with their stock.

THE SOUTH METROPOLITAN GAS-WORKS.

Many important extensions and improvements in plant and apparatus having recently been made at the Old Kent Road station of the South Metropolitan Gas Company, by Mr. George Livesey, the Secretary and Engineer, assisted by Mr. Frank Livesey and Mr. J. Somerville, arrangements have been made, by the permission of the former gentleman, for the publication in the *JOURNAL* of a series of descriptive articles and plates in reference thereto. The subjects which will be so treated will traverse nearly the entire range of practical gas manufacture, and will form a fair epitome of the most modern development of gas engineering as applied in a representative Metropolitan works.

Much interest having been generally manifested throughout the profession, in the large tank and treble-lift gasholder now in course of erection at the Old Kent Road station, we commence the series this week by giving an illustration and abstract of the specification of this concrete tank as originally designed. This, the most important work of the kind yet executed, was treated in the course of its construction as somewhat of an experiment, and the original drawings and specifications were therefore construed, as to the manner of carrying on the work, more as of a directive than as of a controlling character. Many alterations and modifications of the original design were found advisable as the work proceeded, and were freely made, until the tank as completed by the Contractors, Messrs. Dowra and Son, represents the result of the experience of the Engineer and constructors grafted on the original intentions of the former.

We shall next illustrate and describe the tank as it finally stands, pointing out as clearly as possible the deviations that have been made from the drawings now published, and the reasons which led to these modifications.

The following is an abstract of the specification for the proposed concrete tank, 216 feet diameter and 53 ft. 6 in. working depth:—

Four preliminary trial borings have found chalk at a depth ranging from about 46 to 53 feet below the surface of the ground. The top of the finished tank is to be level with the adjoining tank, about 7 feet above the original surface of the ground. Water was found at 15 feet below the surface. Excavation to be carried down to the chalk all round, and on the solid chalk the foundation is to be laid.

The tank to be entirely constructed of Portland cement concrete, in the proportions of 1 of cement to 7 of ballast consisting of about 4 or 4½ parts of gravel and sand from the excavation, and 2½ to 3 parts of clinkers from the retort furnaces to be used for the purpose, to be mixed by hand by being turned over twice dry and once wet, and then carefully and solidly placed in position. The rest blocks, 72 in number, to be 18 inches high, and made of concrete. There is to be no dry wall. The whole inner surface of the tank to be rendered smooth, and cement in two coats of an average thickness of not less than 1 inch in any part of the surface; to be made perfectly smooth and hard by close trowelling; 26 bands of 3½ inch by 1 inch bond iron, with the ends turned down and hooked together, to be placed on edge and bedded in the wall 12 inches from the outside at equal distances from bottom to top. The wall to be 5 ft. 6 in. thick at the bottom and gradually tapering to 3 feet at the top; the backing to consist of sand from the excavation, to be made as solid as possible by punning and watering. The base of the gasholder standards being only 4 feet deep, there will be no piers in the tank wall, which will simply be thickened as shown to receive the 34 bases.

The contractor to provide ample pumping power in duplicate; to be responsible for any damage to adjacent buildings, and to fix the holding-down and guide bolts. The timber framing to support the crown of the gasholder to be independent of this contract.

The usual conditions as to time, payment, soundness of the work, alterations, &c., &c., were, of course, inserted, but need not be repeated here.

THE HEAT OF COMBUSTION OF THE GASEOUS HYDROCARBONS.

Among the determinations of physical constants, an important place must be assigned to those which give the exact amount of heat developed by the chemical union of the various elements with each other. Of special interest are the measurements of the heat developed by the combustion of carbon and its compounds; that is, by the chemical union of carbon and the hydrocarbons with oxygen to form oxide of carbon in the one case, and oxide of carbon and oxide of hydrogen in the other.

M. Berthelot has lately determined the heat of combustion of the hydrocarbons which do not liquefy above the freezing point, by exploding them in a steel shell with pure oxygen. The steel vessel, lined on the inside with platinum, is closed with a platinum screw, having in its centre a capillary tube opening below the threads of the screw, and between them and the conical head, which can be pressed down by a turn of the screw into a conical neck, when the gases have been admitted through the capillary tube into the vessel. A platinum wire is brought through a plug of ivory, as an insulator, into the interior, so that an electric spark can be passed between the wire and the interior surface of the shell. The vessel is plunged into a water calorimeter of the form employed by Regnault in determining the specific heats of the elements. A delicate thermometer, by the side of the shell, indicates the temperature gained by the water, from which the heat of combination is calculated in thermal units according to the metric and centigrade scales. The thermal unit is the quantity of heat required to raise 1 gram of water from 0° to 1° C.

When 12 grams of carbon, in the form of diamond, unite with 32 grams of oxygen, the heat developed is 94 units, *i.e.*, enough heat is produced to raise 94 grams of ice-cold water through 1° C. In the following determination the weight of the combustible taken is proportional to its molecular weight. Carbonic oxide being composed of 12 parts by weight of carbon to 16 parts of oxygen, the heat developed by the combustion of 28 parts by weight of carbonic oxide is compared with the heat produced by the combustion of 12 parts by weight of carbon. By exploding 28 grams of carbonic oxide with 16 grams of oxygen, Berthelot found the heat evolved

to be 68 thermal units. This number agrees admirably with that deduced by Andrews—viz., 68·1 units. Carbon burns directly to carbonic acid, and does not combine with oxygen directly to form carbonic oxide; but since the total heat due to the burning of 12 grams of carbon to carbonic acid is 94 units, and the heat due to the burning of 28 grams of carbonic oxide, containing 12 grams of carbon, to carbonic acid is 68 units, the difference, or 26 units, is the heat due to the union of 12 grams of carbon with 16 of oxygen. By exploding 2 grams of hydrogen with 16 grams of oxygen to form water, the heat of combustion was found to be 69·2 units.

It appears, then, that *equal volumes* of hydrogen and carbonic oxide, when burnt with oxygen, evolve very nearly the same quantity of heat. In the following determinations the weights of the different hydrocarbons exploded are proportional to their molecular weights, so that in each case the thermal result is due to the burning of an equal volume of the combustible:—When 16 grams of marsh gas (CH_4) were exploded with oxygen, they gave 212·4 thermal units as the mean of three experiments; 30 grams of ethane (C_2H_6), prepared by the electrolysis of potassium acetate, gave on explosion 387·4 units; 28 grams of ethylene, or olefiant gas (C_2H_4) gave 340·3 units; 26 grams of acetylene (C_2H_2) gave 315 units. Of the hydrocarbons containing three atoms of carbon the following gases were employed—viz., the paraffin propane (C_3H_8), the olefine propylene (C_3H_6), and the acetylene allylene (C_3H_4). The propane was obtained by the action of concentrated hydriodic acid on cyanhydrate of ethylene, and was separated from hydrogen by dissolving it in absolute alcohol. Of the above, 44 grams of propane evolved 552 heat units in burning to carbonic acid and water; 42 grams of propylene evolved 506 heat units; and 40 grams of allylene, prepared from acetone chlorhydrate, evolved 465 heat units.

Cyanogen gas (C_2N_2) gave, for the combustion of 52 grams, 263 heat units. In 52 grams of cyanogen there are 24 grams of carbon. Now we have seen that 12 grams of carbon burning to carbonic acid evolve 94 heat units, and therefore 24 grams of carbon burning to carbonic acid evolve $94 \times 2 = 188$ heat units. But when cyanogen burns in oxygen, only the carbon is burnt to carbonic acid, while the nitrogen is liberated. The excess of heat evolved by the burning cyanogen is due in part to the separation of the carbon from the nitrogen. We have in this difference, then, a measure of the heat which was absorbed in the union of the carbon and the nitrogen. The measure of heat so obtained by subtraction requires modification in this case for the following reason:—That a certain quantity of the heat developed by the combustion of solid carbon in oxygen is absorbed in vaporizing the carbon—disappears, in fact, as the latent heat of gaseous carbon; whereas the carbon in cyanogen is already gaseous, and (as latent heat) is abstracted from the heat developed by the combustion. But in the case of the hydrocarbons the combustibles and the products of combustion are in the gaseous state, so that the heat of formation of the various compounds can be ascertained with considerable accuracy. In the following table is given a list of combustible gases with their heats of combustion and their heats of formation so deduced:—

Gas.	Formula.	Heat of Combustion.	Heat of Formation.
Hydrogen	H_2	68·0	—
Carbonic oxide	CO	68·0	+ 26·0
Cyanogen	C_2N_2	263·0	— 75·0
Marsh gas	CH_4	212·4	+ 19·0
Ethane	C_2H_6	387·4	+ 7·6
Ethylene	C_2H_4	340·3	— 14·8
Acetylene	C_2H_2	315·0	— 58·0
Propane	C_3H_8	552·0	+ 6·0
Propylene	C_3H_6	506·0	— 17·0
Allylene	C_3H_4	465·0	— 45·0

In the last column of the table the sign + means that so many heat units in the formation of a compound, the sign — that so many heat units were absorbed in the formation of a compound.

These numbers show that the heat of combustion of a hydrocarbon is never equal to the sum of the heats of the combustion of its elements. It is less for the hydrocarbons of the paraffin series than for the others—a fact which shows that heat is given out in their formation, and accounts for their relative stability. The union of carbon with hydrogen in the unsaturated hydrocarbons is attended by an absorption of heat, and this absorption is greater in the acetylene series, where two carbon atoms are joined together by three bonds, than in the olefine series, where two carbon atoms are joined together by two bonds. The union of an olefine with hydrogen is therefore attended by an evolution of heat; the reaction between hydrogen and ethylene ($\text{C}_2\text{H}_4 + \text{H}_2 = \text{C}_2\text{H}_6$) yields 22 heat units, and the reaction between acetylene and hydrogen ($\text{C}_2\text{H}_2 + \text{H}_2 = \text{C}_2\text{H}_4$) yields 45 heat units.

THE USE OF GAS IN LIGHTHOUSES.

As briefly mentioned in last week's "Notes," there has recently been printed, by order of the House of Commons, a copy of "Correspondence between the Commissioners of Irish Lights, the Trinity House, and the Board of Trade, respecting the Improvement of the Light on, and the Establishment of a Fog Signal at Copeland Island, and the Adoption of Gas instead of Oil as a means of Illuminating that Station." This parliamentary paper, which is the fifth on the subject of the use of gas for lighthouses, contains letters ranging from the 12th of March last year to the 18th of May this year, and is full of interest in many respects, bringing the question down to the latest date.

Briefly stated, the facts are these: About 16 years ago Mr. John R. Wigham, of the firm of Messrs. J. Edmundson and Co., having strongly advised the Commissioners of Irish Lights to use gas instead of oil for their lighthouses, was requested by that body to

design a gas-burner for the purpose. He therefore did so, and arranged a burner capable of being increased in power from that of the ordinary lighthouse light suitable for clear weather—namely, 429 candles—to that suitable for the densest fog—nearly equal to 12,000 candles. The highest candle power ever evoked by the largest oil lamp which the lighthouse authorities of Great Britain or the Continent have ever made is only 722 candles, so that the enormous gain to the seaman by the use of gas is self-evident. Such, however, is the prejudice against anything new which is found in certain official minds, that it has been only with very great difficulty that nine of our principal lighthouses have been lighted by gas. The progress of gas lighting for this purpose has been opposed at every step by engineers and others who seem wedded to the old oil-lamp system, inasmuch that the Commissioners of Irish Lights became perplexed, and called into their councils Dr. Tyndall, of the Royal Institution, who is the Scientific Adviser to the Board of Trade. His reports from time to time respecting the advances made by Mr. Wigham in his appliances for using gas in lighthouses, coming from so eminent a source, were more than a match for the groundless objectors of the old school, as will be seen from the correspondence we shall quote hereafter.

The present parliamentary paper describes the efforts of the Commissioners of Irish Lights to introduce gas for the illumination of a very important lighthouse at the turning-point of Belfast Lough, and the obstructions with which they were met, although there is hardly a point in the Channel that more requires a powerful light. The Board of Trade, to whom all lighthouse expenditure must be submitted for sanction, without even giving a reason, peremptorily declined to sanction the use of gas, preferring that paraffin should be employed. But the Commissioners maintained their point, and ultimately wrenched a reluctant consent from the Board.

The first of the published letters with which we have to do is one from the Commissioners of Irish Lights, dated July 7, 1879, in reply to a letter from the Board of Trade asking for an estimate of the cost of certain suggested improvements of the light on Copeland Island and the establishment of a fog signal at that station. The Secretary to the Commissioners enclosed estimates prepared by their Engineer "(1) for altering the present catoptric light to a dioptric light burning gas, and a powerful fog 'siren' driven by a gas or calorific engine; (2) for the same order light burning mineral oil, and similar fog signals." In submitting these, he remarked: "I am to convey to you the recommendation of the Commissioners that gas should be adopted as the illuminant at this station—a recommendation which they are strengthened in making by a very interesting report which Professor Tyndall has made to them, on the result of recent gas experiments carried out under his direction at Galley Head, and by the manner in which he therein advocates the extension of the gas system of lighthouse illumination."

The following is the estimate referred to:—

Estimated Cost of altering present Light to a First Order Fixed Dioptric Light.—Cost of Works for Burning Gas, or Mineral Oil in a 6-wick Burner; to work with either System a powerful Fog Siren driven by a Gas Engine or a Caloric Engine.

	Gas.		Mineral Oil.	
	Fog Siren worked by a Gas Engine.		Fog Siren worked by a Caloric Engine.	
	£	s. d.	£	s. d.
Cost of works	9487	6 9	8470	18 2
Annual maintenance	455	12 9	362	1 4
Ordinary repairs	146	9 8	186	4 4
Special repairs	125	6 11	119	12 4
Interest on estimated outlay, at 8½ per cent.	330	6 2	296	9 6
Total cost of maintenance	1057	15 6	914	7 6

The details of the cost of the works in both instances were given.

In reply to the above-named letter, the Board of Trade replied that, "looking to the considerable excess both as regards first cost and maintenance in the estimate for a gas establishment over that for an oil light," they required of the Commissioners "fuller reasons for their preferring to employ gas at this station." In response to this request, the Board of Trade were furnished with a copy of a report by their Committee of Inspection which had been adopted by the Commissioners. The Committee had again considered the question; and being of opinion the light "should be a first-class light capable of being augmented during fogs to the highest pitch at present known," adhered to their recommendation, "founded on the expressed opinion of Dr. Tyndall (in his report on gas), that gas should be the illuminant, it being the only one as yet proved by experience capable of being augmented to duplex or triflex, as necessity may require." They stated they did this "notwithstanding the joint report of the Inspector and Engineer," which is printed among the appended documents, and which says they consider "the future use of a 6-wick Trinity burner consuming paraffin oil to be preferable to the adoption of gas, the first cost and annual expenditure for maintenance being much less; the use of oil allowing the light to be made of as distinctive a character as does gas, whilst the adoption of the former illuminant would only entail an expense which would form a necessary portion of a much larger amount required, should a change again be made to gas or electricity." Their report also stated that the estimate given above would need certain modifications which would "swell the gas estimate and lower the

proportion of that for oil." An amended estimate was then ordered to be sent to the Board of Trade, and this was received on the 1st of October, 1879. It showed a reduction in the cost of the oil lighting, owing to the cheapening of mineral oil; but an increase in the gas items, owing to £200 being added for a house for an extra keeper, or mechanic, to attend to the fog signal machinery, also the extra cost of the triforium apparatus. The figures stood as under:—

Estimated Cost of altering present Light to a First Order Fixed Dioptric Light.—Cost of Works for Burning Gas in a 48-jet Burner in Triforium, with a powerful Siren driven by a Gas Engine; and for Burning Mineral Oil in a 6-wick Burner, with a powerful Siren driven by a Caloric Engine.

	Gas.	Mineral Oil.
	48-jet Burner in Triforium, with Siren driven by Gas Engine.	6-wick Burner, with Siren driven by Caloric Engine.
	£ s. d.	£ s. d.
Cost of works	10,311 14 9	8,470 13 2
Annual maintenance	537 3 5	348 2 6
Ordinary repairs	155 7 5	136 4 4
Special repairs	130 18 9	119 12 4
Interest on estimated outlay, at 3½ per cent.	357 8 2	296 9 6
Total cost of maintenance	1,170 17 9	900 8 8

The Board of Trade having written the Elder Brethren of the Trinity Board for their opinion on the proposal of the Irish Commissioners, a reply was by Mr. Inglis in the following terms:—

According to their own experience, the Elder Brethren prefer oil to gas as an illuminant, and they consider that if the light be still retained as a fixed light, an intensity equal at least to that of gas can be maintained by means of oil, and even if the biforum or triforium system were adopted, the oil system is applicable with concentric lamps, as has been shown by the instruments constructed by Mons. Lepeauté, in Paris.

The Elder Brethren do not, therefore, from their own experience, feel disposed to advocate the adoption of gas for illumination at Copeland Island, at all events until its greater economy can be proved; but as respects its employment in working a fog signal, the Elder Brethren have not any experience upon which to form an opinion.

I am to enclose, for the information of the Board of Trade, a statement of expenses for the last financial year at Haisbro' (gas) and Orford (oil) Lighthouses respectively, which appears, in effect, to corroborate the estimates of the Irish Commissioners.

The actual expenditure, from March, 1878, to March, 1879, at the Haisbro' and Orford Lighthouses, referred to above, is appended:—

Haisbro'—Two Gas Lights.

Wages—		
One principal keeper	£ 477 11 0	
Two assistant keepers, at £63 13s.	127 6 0	
One do.	61 9 0	
One do.	59 16 0	
Uniform	£ 396 2 0	
Rents—tithes	20 17 0	
Coals—	0 5 4	
84 tons cannel, at £1 14s.	£ 1143 16 0	
53 tons furnace, at 16s. 2d.	8 3	
Carriage, including town dues	78 16 0	
Lime	264 13 3	
Oil and cleaning stores	15 5 6	
Carriage of stores	13 6 1	
Carriage of stores	13 18 7	
Coal and fuel for dwellings	44 9 0	
Repairs—		
Ordinary	77 11 2	
Special	174 6 5	
Incidentals	45 16 4	
Note.—The expenditure for special repairs is a heavy item in the year's account, and might be spread over several years. The charge under incidentals is quite unusual, it generally is less than £15. If, then, were deducted for special repairs	£ 100 0 0	
Incidentals	25 0 0	
The year's expenditure would be	£ 871 10 8	

Orford—Two First-class Oil Lights.

Wages—		
One principal keeper	£ 70 2 6	
do.	64 0 0	
One assistant keeper	50 0 0	
One do.	54 0 0	
Uniform	£ 245 2 6	
Oil	19 10 0	
2211 gallons, at 1s. 3d.	£ 138 3 9	
Carriage of oil and stores	24 14 11	
Cleaning stores, &c.	162 18 8	
Coals for dwellings	25 0 0	
Repairs—general	64 9 0	
Boat hire	154 14 0	
Incidentals	10 0 0	
Incidentals	3 3 0	
Note.—For 6-wick burner in lieu of 4-wick, &c.	£ 654 17 10	

(This appears to be a very fair average, except that the charge for repairs is rather high.)

The Board of Trade, in a letter to the Trinity House, dated Oct. 13, 1879, stated that they declined to authorize the introduction of gas at the Copeland Island station; and in a letter the same day to

the Irish Commissioners conveyed "their sanction to an expenditure of the estimated sum of £8470 13s. 2d. for the purpose of altering the present light at Copeland Island into a first-class dioptric light, burning mineral oil in a 6-wick burner, with a powerful siren driven by a caloric engine." In respect to this letter the Commissioners forwarded to the Board a copy of the following resolutions unanimously passed by them, and asked for an appointment for the deputation alluded to:—

That this Board has read with regret the recommendation of the Board of Trade to light Copeland Island with mineral oil, but cannot see their way to alter their opinions, before expressed, that gas is the best illuminant for this and other important lighthouses. This opinion is borne out by the experience of 14 years trial of the system in the lighthouses under the care of the Board, and is strengthened by the reports of Professor Tyndall, their scientific adviser. In order to explain fully to the Board of Trade the ideas of the Commissioners, that a deputation consisting of the Earl of Meath, Lord Viscount Monk, the Lord Mayor of Dublin, and Mr. Stirling, be appointed to wait upon the Board of Trade to reason with them, and point out why the Commissioners adhere to their opinion that gas is the best illuminant; and that the Secretary be instructed to write to the Board of Trade, asking them to arrange for an early appointment with Lord Stirling.

No opportunity having been afforded for the deputation to meet Lord Stirling, they addressed a letter to him on the 30th of December. This, though very lengthy, we reproduce, because it is so forcible an expression of the superior advantages of gas over oil, or, for the matter of that, electricity. It was as follows:—

To the Right Hon. the Viscount Sanlon, M.P., President of the Board of Trade.

My Lord,—The deputation appointed by the Board of Irish Lights to wait upon the Board of Trade, to explain the grounds on which they so urgently solicit liberty to extend further the development of gas, having unfortunately failed in arranging a time for a meeting with your lordship, which would be convenient to both parties, and foreseeing further the impossibility on the part of the deputation of being able to arrange a meeting amongst themselves for the next two months, have thought it advisable, in the interest of the public service, to place on paper the arguments that impel the Irish Lights Commissioners to seek, without further delay, for permission to develop still more the gas system of illumination, which has been so successfully established on the Irish coast. The deputation, therefore, in the first place, beg to submit the following concise summary of what has taken place of late years, which they are satisfied will bear out their opinion of the superiority of gas over all arrangements of mineral or other oils as yet arrived at.

Gas was first applied at Howth Bailey in 1865, more than 14 years ago, and six other lighthouses—namely, St. John's Point, Rock-a-Bill, Wicklow Head, Hook Tower, Minehead, and Galley Head—have since been lighted with gas. The light has never failed, and its application has given the Commissioners and the navigating community generally the most unqualified satisfaction. They have abundant proof, from both scientific and practical men, that its introduction has been of incalculable benefit to navigation.

In 1873 the Commissioners determined to extend the advantage of the system to other lighthouses; but certain patent rights of the inventor having to be arranged between the Board of Trade and him, a considerable delay occurred, and it was not till 1876 that the Board of Trade came to an arrangement which enabled them to authorize the Commissioners to proceed with such extension of gas as they might consider desirable to lay before the Board of Trade for their sanction. The Board of Trade, on their part, intimating that they would be prepared to consider favourably any proposition the Commissioners might deem advisable to place before them.

Since then the Commissioners applied for sanction to use gas in three lighthouses—viz., Tory, Fanad, and Copeland Island—the patentee having generously offered, in return for the sanction, to do the work on his part, and in consideration of the fact that the Board of Trade, on their part, intimating that they would be prepared to consider favourably any proposition the Commissioners might deem advisable to place before them.

Nothing has occurred since 1865 to alter the opinion of the Commissioners as to the superior value of gas in lighthouses as compared with oil. These advantages have been proved by the experience of 14 years, and during that time the patentee has introduced many important improvements, which have made it additionally valuable, especially to meet the requirements of thick weather, not only in the case of fixed lights, but also in applying the system to revolving lights; and such changes giving rise to the lighthouse keeper the power of instantaneously increasing the light according as the state of the atmosphere may render it necessary, from a light equal to 430 candles to a light, as in the case of Galley Head, equal to 5000 candles. The Trinity House has recognized these advantages, and has not only had the two houses Haisbro' and Orford, but also the two houses Wicklow Head and Hook Tower, on their part, intimating that they would be prepared to consider favourably any proposition the Commissioners might deem advisable to place before them.

As these improvements were brought under the notice of the Commissioners, their scientific adviser, Professor Tyndall, from time to time investigated them, visiting Ireland for this purpose. His reports have been uniformly favourable, and his recommendations for the adoption of these improvements have been acted upon by the Board of Trade. On the recent occasion of his visit to Galley Head, after giving his own opinion and those of other scientific men in favour of gas for lighthouse purposes, he says: "No words of mine could add any force to the consensus of evidence here brought forward; and when we remember the casualties which have occurred, even in the neighbourhood of lighthouses, through inability to see the light, it surely behoves us not to throw away the chance of mitigating such calamities by the employment of a light capable of behaving in thick weather in the manner described by Sir William Thompson, Mr. Gray, and Mr. Hamilton;" and in describing the effect of the Gas by Haisbro', when it was last before the Commission, he says: "In the cloudy air above the lighthouse every pulse of the flame was distinctly visible after the direct beam had disappeared. I cannot but think that these atmospheric thrills will prove of great importance to the mariner, even in atmospheres thick enough to render the light itself invisible."

When it was last before the Commission, he says: "On the whole, he had never seen a finer light;" and, in conclusion, he adds, "that gas lends itself with admirable

freedom to any change in its mode of application which it may be thought desirable to make. The suppression, for example, of the flashing apparatus at Galley Head would convert that light into an ordinary revolving light, surpassing any other in the world. Indeed, were the power of the burner reduced to 48 jets instead of 68 jets, the light with its full strength involved would still transcend all other revolving lights." These facts appear to the Commissioners conclusively to show that they were fully justified in making the recent proposal to use gas in the three lighthouses above referred to, and thus secure to the maritime people the advantages of this superior system of lighthouse illumination; and in this view they are glad to know they are supported by the Elder Brethren of the Trinity House, who state, in the conclusion of the report on the exhaustive experiments made at Haisboro, by direction of the Board of Trade, on the use of gas for lighthouses, that "if called on to advise the Board of Trade in that respect, they would be prepared, in deference alike to the wishes of the Irish Board, and to the strong opinion in its favour of their valued adviser, Dr. Tyndall, to recommend to the Irish Commissioners, who take so great an interest in it, should have authority for the expenses of proceeding further with its development."

The deputation think it their duty to remind the Board of Trade that the principle of sanctioning additional first outlay, when there is a fairly anticipated expansion of increased benefits to navigation in view, has not only been carried out in the case of these lighthouses already lighted by means of gas, but in those where the electric light is the illuminant. From a parliamentary paper (June 13, 1879) which the Commissioners have lately received, they find valuable evidence given by Mr. Farrer, Secretary to the Board of Trade, Sir Richard Collinson, Deputy-Master to the Trinity House, and Mr. George Engineer, respectively, on the electric light as applied to lighthouses. From this evidence it appears that large sums have been sanctioned by the Board of Trade for experimental trials of the electric light, in view of applying it to lighthouses. The total first cost of the electric light at four stations is as follows:—

First Cost.

Dungness	£11,600 0 0
Souter Point	17,300 0 0
South Foreland (two towers)	26,000 0 0
Lizard (two towers)	22,500 0 0

Maintenance.

Dungness	£1588 7 2
Souter Point	1884 16 11
South Foreland (two towers)	2771 9 3
Lizard (two towers)	2305 6 4

Table of Comparative First Cost and Annual Maintenance of Electric and Lamp Light, in the case of the Lizard Fixed Light, which shows most favourably for the Electric Light.

Lizard (first cost, one tower	£11,250 0 0
Compared with oil	6,500 0 0
Shows greater first cost electric light	£4,750 0 0

Lizard, annual maintenance, one tower	£1,152 13 2
Compared with oil	681 17 8

Shows greater cost, per annum, electric light £470 15 11

With regard to the only revolving light—

Souter Point, first cost, electric light	£17,300 0 0
Oil, similar light	7,000 0 0
Greater first cost electric light	£10,300 0 0

Souter Point, annual maintenance	£1,834 16 11
As against similar oil	719 7 3
Shows greater annual cost of electric light	£1,115 9 8

The deputation beg the Board of Trade to believe that, in bringing forward these figures, they highly appreciate the sound policy of the Board of Trade in thus affording the Elder Brethren facilities to work out a problem—namely, the applicability to lighthouse illumination of the electric light, the solution of which must be of the highest importance to humanity; and that they only regret that in the sanguine hope that the same opportunity, to a certain limited extent, may be afforded to the Commissioners to work out their gas system, which has already given so fair a promise of proving such a grand boon to the commerce of the United Kingdom. Its superiority in drier weather and in fogs is well worthy of considerable additional first outlay, and, if it were the fact, in annual maintenance also; but in the annexed statement it is clearly shown that, candle light for candle light, gas is considerably the cheaper; but the Commissioners, feeling the high responsibility placed in their hands, of affording to the large and increasing seafaring population all the improvements in coast illumination that science from time to time develops, have always been anxious to adopt every improvement calculated to save life and property, and in this principle they feel confident they are supported by the general opinion of the country, and they are further fortified in firmly adhering to this principle by the statement of Mr. Farrer, given in evidence before the Committee of the House of Commons, that "the cost of a lighthouse is as nothing compared with its maintenance," adding that this is not only his own opinion, but the principle upon which the Board of Trade deals with such expenditure.

In accordance with directions, on the 7th of July, 1879, the Commissioners forwarded to the Board of Trade estimates drawn out by their Engineer of the relative cost of a first order dioptric mineral oil light with powerful fog siren for Copeland Island, and a first order gas light with powerful siren for the same place:—

Estimated cost of gas light	£9437 6 9
" " " " mineral oil	8470 13 2

The Board of Trade, though strongly urged by the Commissioners to adopt gas, returned as an answer that they would only sanction £8470 13s. 2d. exhibiting the works to be under the superintendence of the Engineer of the Board. This tender the deputation are glad to see, as it is a powerful siren for a somewhat less sum than that estimated for the same light by the Board of Trade for a mineral oil light, the highest illuminating power of the oil being 722 candles, that of the gas being 1288 candles, including patentee's rights and the new developments of gas not as yet exhibited in the works to be under the superintendence of the Engineer of the Board, and to be approved of by him. This tender the deputation are prepared to lay before the Board of Trade, and to recommend its acceptance.

The deputation have to observe that Copeland Island, being not only a leading light to all going up or down Channel, but also one of considerable importance to vessels seeking shelter in the Bangor roadstead, is situated in a locality where heavy mists and fogs abound during a considerable period of the year; and the deputation beg leave to draw the attention of your Lordship to the following quotation from the report of the Inspecting Committee of this Board, dated Sept. 12, 1879, in reference to this light, in which the deputation fully concur:—"In their opinion this light is one of the most important in Ireland to the large amount of passing shipping, and they therefore consider that it should be a first-class light, capable of being augmented during fogs to the highest pitch at present known. They therefore, notwithstanding the joint report of the Inspector and Engineer (which they recommended to be forwarded to the Board of Trade), adhere to their recommendation, founded on the expressed opinion of Dr. Tyndall in his report on gas, that gas should be the illuminant, it being the only one as yet proved by experience capable of being augmented to duplex or trifram, as necessarily may require."

The deputation beg to present with these observations a statement, prepared by Mr. Wigham, of the relative cost of mineral oil and gas, in its varied modifications, with comparative power of each in illumination, which is the only just basis on which an opinion can be formed.

[Enclosure.]

MEMORANDUM OF ANNUAL COSTS.

No. 1.—Paraffin.

Six-wick lamp, burning three outer wicks only, costs 8s. 8d. per night, for 305 nights (clear weather), say	£132 5 0
Six-wick lamp at full power (foggy weather) cost 11s. 10d. per night, for 60 nights, say	35 12 0
Maximum illuminating power, 722 candles.	£167 17 0 per ann.

No. 2.—Trifram Gas Light.

(As recommended by Mr. W. Douglas.)

One 28-jet burner costs 6s. 8d. per night, for 305 nights, say	£102 6 0
Three 28-jet burners cost £1 6s. 2d. per night, for 60 nights, say	6 10 0
Maximum illuminating power, 1288 candles.	£102 16 0 per ann.

Cost of paraffin greater than gas by 25 1s.
Illuminating power of gas greater than that of paraffin by 566 candles.

No. 3.

One 28-jet burner for 305 nights	£102 6 0
Three 28-jet burners cost £1 16s. 8d. per night, for 60 nights, say	110 0 0
Maximum illuminating power, 2496 candles.	£212 6 0 per ann.

Cost of paraffin less than gas by 24 1s.
Illuminating power of gas greater than that of paraffin by 1774 candles.

Note.—These figures as to paraffin are taken from the Trinity House Table (Parliamentary Paper C, 1151, 1875), but in this calculation the price of paraffin is reduced to that now paid by the Commissioners of Irish Lights, and instead of taking one-half for the consumption of paraffin in clear weather, I take the actual consumption of the three outside wicks, as it is the three inside wicks which are turned down in clear weather. The consumption of the three outside wicks is much more than half, they being so much greater in circumference. The figures as to gas are also taken from the same parliamentary paper. Particulars of the burners are under—

Single Gas-Burners.

Nature of Burner.	Illuminating Power in Candles.	Consumption per Hour in Cubic Feet.	Cost per Hour.	Cost per Night (12 Hours).
			s. d.	£ s. d.
28-jet	429.6	51.4	0 6 73	0 6 8.3
48-jet	832.0	93.2	1 0.2	0 12 3
68-jet	1213.18	146.3	1 7.3	0 19 3.6
88-jet	1820.0	219.0	2 12.2	1 12 2
108-jet	2223.4	308.0	3 4.6	2 0 7.8

Trifram Gas-Burners.

Nature of Burner.	Illuminating Power in Candles.	Consumption per Hour in Cubic Feet.	Cost per Hour.	Cost per Night (12 Hours).
			s. d.	£ s. d.
28-jet	1288	154	1 8.3	1 0 2
48-jet	2496	279	3 0.6	1 16 2
68-jet	3759	438	4 10.6	2 17 11
88-jet	5022	594	5 8.6	3 16 7
108-jet	6285	744	7 0.2	4 11 11

Table showing the Comparative Annual Cost of Paraffin and Gas, taking into account the Maximum Illuminating Power in each case.

Annual cost of producing an illuminating power of 100 candles—	
With 6-wick paraffin lamp burning 3 wicks for 305 nights, and 6 wicks (full power) for 60 nights	£23 5 0
With trifram gas 28-jet burner for 305 nights, and 3 48-jet burners for 60 nights	12 12 9
With trifram gas 28-jet burner for 305 nights, and 3 68-jet burners for 60 nights	8 10 11
With trifram gas 28-jet burner for 305 nights, and 3 88-jet burners for 60 nights	7 6 9
With trifram gas 28-jet burner for 305 nights, and 3 108-jet burners for 60 nights	5 6 8

Or reduced to a unit of one candle power.	
Annual cost of producing an illuminating power of one candle—	
With paraffin burned as above	4s. 8d.
With trifram gas as above, 28-jet burner	2 6
" " " " 48-jet burner	8 8
" " " " 68-jet burner	1 5
" " " " 88-jet burner	1 1
" " " " 108-jet burner	1 0

After considering the matter till the 26th of February, the Secretary of the Board replied, stating:

With reference to Mr. Wigham's tender, I am to point out that the Board of Trade now hear of its existence for the first time, and have hitherto been without them an estimate for the erection of a gaslight at Copeland Island much higher than that for mineral oil.

As regards Mr. Wigham's statement of the cost of gas, I am to observe that it appears to be open to serious criticism, particularly that portion of it which relates to the use of the trifram light with three 28-jet burners for 60 nights in the year. For although in the parliamentary paper relating to the results of the Haisboro experiments, on which Mr. Wigham's calculations are based, it is estimated that the proportional yearly cost of each

28-jet burner will be only £115 18s. 10d., when an average hourly consumption of as much as 130 cubic feet of gas is required, the whole annual cost of such a station is stated to be £270 13s. 7d., and in the same paper it is distinctly stated that where an average hourly consumption of only 51·4 cubic feet of gas is required, the annual cost will be £186 9s. 4d. for the station.

As Mr. Wigham's estimate appears to assume an average hourly consumption of 68·3 cubic feet of gas, the total cost, adding the cost of the additional quantity of canal coal and lime required, will be £307 4s. 2d., instead of £102 16s., as stated.

In like manner the cost of the arrangement for introducing the triforium gaslight with three 48-jet burners for 60 nights in the year would be £322 9s. 9d. per annum, instead of £212 6s., as stated by Mr. Wigham.

In the experience of the Board of Trade, however, the comparative estimates based upon the experiments at Halsbro' are not borne out, and it is clear, from the lighthouse accounts of the Commissioners at the Board of Trade, that the average annual cost of the six Lighthouse stations in Ireland (omitting Galley Head), where gas has been introduced, exceeds the cost of maintaining a station where mineral oil with the 6-wick burners is used, by at least £129 per annum, and that of a station where the illuminant is mineral oil with the 4-wick burner by at least £220 per annum, taking into account the interest on the greater original outlay for gas and the remuneration to Mr. Wigham for the use of his patents.

With regard to the electric light, I am to observe that the Trinity House, on account of the great cost of this mode of illumination, have not hitherto proposed to extend its use beyond the three stations at which it has already been introduced.

The Board of Trade wish to express no final opinion against gas either at Copeland or elsewhere, but they think it only right to be as clear as possible on the subject of cost before proceeding further.

With this object they desire me to request that they may be furnished with an estimate (reviewed by the Commissioners, with the help of their Engineers) of the first cost of introducing gas at Copeland Island (including the first cost of the fog signal), in the manner now proposed by the Commissioners, and also of the annual cost of maintenance.

But we have carried our extracts from this interesting correspondence far enough for this week, and shall reserve the concluding part of the parliamentary paper to be dealt with in next issue.

Notes.

[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

ARCHER'S COAL-WHIPPING APPARATUS.

Mr. Thomas Archer, of the Dunston Engine Works Company, Gateshead-on-Tyne, has recently brought out a very effective apparatus for whipping coal, &c., which practically supersedes hand labour for this purpose in vessels fitted with it, and being, moreover, as expeditious as any form of hydraulic or stationary steam-hoisting machinery, it also renders a collier independent as to berth in dock or alongside a pier. A cargo of coal, grain, or any other material that can be discharged by an ordinary winch and derrick may, by the help of this apparatus, be discharged into barges in mid-stream or in the most primitive of harbours, as quickly and economically as alongside a wharf fitted with the most complete appliances for unloading. Although Archer's apparatus may be used for getting out any kind of heavy goods, it is as a means of discharging coal cargoes that it possesses especial claims for notice here. The apparatus is remarkably simple, consisting of a steam-tight drum containing a barrel on which is wound the length of chain required for the hoist, the other end of the chain being attached to a piston fitting in a long barrel or steam cylinder, in connection with the interior of the drum, fixed upright in the hold where fitted for use on board ship. The same shaft that carries the enclosed barrel is prolonged beyond the drum through a stuffing-box, and carries a winding barrel supported in a suitable frame, like that of an ordinary crab-winch. On this barrel is wound the lifting chain after passing over a gin attached to a derrick in the usual way. When ready for hoisting, the piston is drawn up to the top of the cylinder, and upon steam being admitted to the drum, the piston is caused to make a stroke downwards in the cylinder, unwinding the chain from the enclosed barrel, which it consequently causes to revolve, and therefore at the same time the hoisting barrel in connection with it winds up the lifting chain. It will thus be seen that there are no valves or other complicated appliances, the steam inlet being fitted only with a two-way cock for steam and exhaust, and the hoisting work being done in reality by the direct stroke of a steam piston without the intervention of multiplying gear of any kind. The apparatus may be worked at any required speed, and in its manner of working bears a close resemblance to a hydraulic crane. The steamship *Carbon*, trading from the North with coals for the South Metropolitan Gas Company, has been fitted with three of these patent coal-whips, and has discharged twice in the Surrey Commercial Docks entirely by their aid. On her last trip, her cargo of 980 tons was got out into barges, lying alongside in the middle of the dock, in 15 hours, with 28 men employed as fillers and tipplers. The same weight of coal, with hand whipping, would take 45 men 20 hours to discharge. The saving in time and labour by the use of the apparatus on shipboard is therefore indisputable, while it may, of course, be adopted for similar purposes in works on shore, as a substitute for hydraulic lifting apparatus; or water pressure, if available, may be used instead of steam as the motive power.

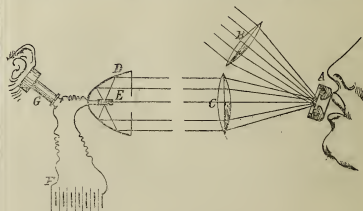
THE KIND-CHAUDRON PLAN OF SHAFT-SINKING.

What is known as the Belgian system of shaft-sinking has been introduced in the Newcastle coal-field for the purpose of penetrating downwards through water-logged strata encountered in the course of

sinking a pit at Marsden, between Sunderland and South Shields, by the Whitburn Coal Company. This system of boring, which is really the invention of a German Engineer, Herr Kind, and a Belgian Mining Engineer, M. Chaudron, is much used on the Continent, but the Marsden experiment is stated to be the first instance of its successful application in England. The Whitburn Coal Company were led to its adoption by the failure of the ordinary means for preventing the irruption of water into the shaft, and they appear to be well satisfied with the results of the trial. There are two processes combined in the Kind Chaudron system—the first, for making the bore, being the special invention of the former gentleman; while the second, for lining the shaft and keeping out the water, is due to the latter, the two being necessary to each other. The boring is performed by a drill, between 6 and 7 feet in diameter, weighing 11 tons, and named a "trepan." The face of the trepan is provided with a line of cutting teeth, or chisels, weighing 3 cwt. each. The trepan is connected by wooden shafting to a rocker at the surface, and it is raised and dropped by steam power, being also turned round at the same time so as to act in a manner precisely similar to that by which a hand-drill is made to penetrate stone. The cuttings are extracted from the bore-hole by a large spoon shell in the usual way. When the trepan has cut its way through the water-bearing strata, a larger one is substituted for it, which enlarges the bore to the size required. The second trepan in the present instance weighed 20 tons, and worked in the same way as the smaller drill. Thus there is no essential difference between the action of a stonemason's hand drill and that of Herr Kind's trepans. The water in the bore-hole is not removed during the progress of the operations, as it assists the cutting action of the chisels. The lining of the shaft is of iron, put together in the mouth of the shaft, and provided with a temporary bottom, which enables it to float on the water in the boring, and allows it to be gradually sunk, as constructed, until it passes below the water-logged strata. This tube being, of course, smaller than the boring, is then backed with cement grout until quite solid. The shaft is thus complete, and quite water-tight. The Kind Chaudron process has been tried in two shafts at Marsden, in both of which the water-bearing rock was met with at about 110 feet below the surface, and continues to the depth of 350 feet. Fifteen men are employed in the sinking, the average rate of boring being 1 ft. 8 in. with the small drill, and 1 ft. 6 in. with the large drill per day. As will be seen, the apparatus required and the method of making and lining the bore are extremely simple, the magnitude of the boring being alone remarkable. It is stated, however, that by the adoption of this plan valuable coal seams at a great depth below water-logged strata, and otherwise unattainable, have been brought into profitable working.

PROFESSOR BELL'S PHOTOPHONE.

In a recent "Note" a brief description was given of Professor Bell's discovery of means whereby the property of selenium of varying in electrical conductivity in proportion to the amount of light to which it is exposed, could be turned to useful account in the transmission of sound and speech. Below is reproduced an illustration, from the *Scientific American*, that shows very clearly the principle upon which the various forms of Bell's photophone have been constructed.

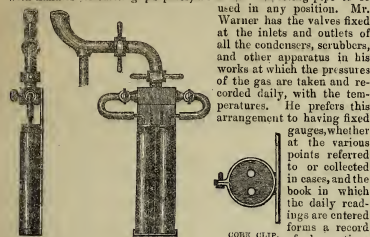


A beam of light from any source, shown in the engraving as coming from above, is concentrated by the lens, B, upon the diaphragm, A, which is made of some material capable of reflecting light and also of vibrating like a drum-head. The diaphragm is placed at such an angle with reference to the incident beam of light passing through the lens, B, as to reflect the light through the lens, C, along the line striking the axis of the parabolic reflector, D. The lens, C, renders the divergent rays of light parallel, and the parabolic reflector concentrates the light upon the selenium cell, E, placed in its focus. The selenium forms a part of an electrical circuit which includes the battery, F, and the receiving telephone, G. A sound made in the vicinity of the transmitting instrument, in connection with which the reflecting diaphragm is fitted up, causes the diaphragm to vibrate, and undulates the reflected beam of light passing through the lens, C, and the consequent variations in the intensity of the light concentrated on the selenium by the parabolic reflector change the electrical conductivity of the selenium, and render the electric current undulatory. These undulations affect the receiving instrument in the same way as it would be affected in an ordinary telephone circuit, and any sounds that may be made in the transmitting instrument are reproduced in the telephone, G. Professor Bell has made about fifty forms of photophone, but the principle of them all is substantially as described. The distance

through which the photophone will work has not been determined; but it is believed that the extreme range will be limited only by the difficulty of adjusting the receiving to the transmitting apparatus when widely separated. Professor Bell has found that various obstacles in the path of the sound-carrying beam act differently on the power of the receiver to reproduce the sounds. A solution of alum or bisulphide of carbon does not diminish the tone produced, but a solution of iodine in bisulphide of carbon cuts off most, but not all of the audible effect. Even an apparently opaque disc of hard india-rubber fails to stop the sounds entirely. The operative rays, whatever they are, have also been able to act through two sheets of hard rubber having a solution of alum between them. Hence some invisible rays are capable of producing the desired effect, although, for convenience sake, Professor Bell has termed his newly-invented apparatus the *photophone*, because the rays of an ordinary beam of light contain those forms of radiant energy which are operative.

WARNER'S TEST-PIPE AND MARKET-STAND VALVES.

In a communication read by Mr. W. J. Warner, of South Shields, before the British Association of Gas Managers in 1876, he described a then recently patented invention intended to facilitate the temporary connection of service-pipes to gas-mains. At the late meeting, in Sunderland, of the North of England Gas Managers Association, an adaptation was shown of the valve to the purpose of testing for carbonic acid and sulphuretted hydrogen. The accompanying is an illustration of the appliance as modified to serve this purpose, and also that of taking the pressures. The two joints (shown provided with handles for turning purposes) allow the connecting-pipe to be used in any position. Mr.



Warner has the valves fixed at the inlets and outlets of all the condensers, scrubbers, and other apparatus in his works at which the pressures of the gas are taken and recorded daily, with the temperatures. He prefers this arrangement to having fixed gauges, whether at the various points referred to or collected in cases, and the book in which the daily readings are entered forms a record of observations which must be useful for purposes of comparison. There are at present about 400 of these valves fixed, above 200 being in the open market-places of South Shields. The market stall-keepers are enabled to hire the use of a stand-pipe, with one to half-a-dozen lights, at a sum per light varying according to the number required, the Gas Company fixing and removing the stand-pipe, which may be used from dusk to midnight. The trouble attending this arrangement is very slight as far as the Company are concerned; one man fixes and removes the pipe, and collects the tickets for them, which are paid for in advance. For other places than markets these stand-pipes and valves would be extremely useful. Wharves, docks, gardens, and streets where outdoor trading is carried on, might be improved in appearance and even in safety by this means.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

MR. G. LIVESBY ON THE ECONOMY OF CARBONIZATION.

SIR,—The three letters in the last number of the JOURNAL, on "Economy of Production," will, I am sure, be appreciated by your readers as useful and interesting contributions to the question under discussion.

The point made in the third paragraph of Mr. Stevenson's letter, that high heats mean quick production, is good, and well worthy of consideration in an investigation of this question. As to the quantity of tar, I do not consider that a return showing a high make of tar, where there is also a high make of gas, is any proof that as much tar is produced with high heats as with more moderate temperatures. It often happens that with low heats, such as is the case when retorts are first charged, a great quantity of tar is deposited and lost in the mouthpiece, owing to its condensation in the ascension-pipe through the heat not being sufficient to maintain it in the state of vapour until it reaches the hydraulic main. Let it be proved that the quantity of gas can be increased without loss either in quantity or quality of tar, and I at least shall not be sorry to strike the 2d. out of my estimate.

Mr. Stevenson has, I think, misunderstood my estimate of extra fuel. The words were, "Extra fuel estimated at least 10 per cent.;" that is, 10 per cent. on the fuel used, not 10 per cent. on the coke made.

I am obliged to Mr. Woodall—the maker of the cheapest gas in the kingdom—for his contribution; he furnishes an element of great importance to the discussion, which I had overlooked. It is a fact within my knowledge that as much as 12, or even more, per ton has been asked and given for coal, on the ground that such coal produced a greater volume of gas than other coals, that, on the whole, were at least equal to the higher-priced coal.

There is a further evil connected with this competition for a high make per ton. A manager is liable to under-estimate the quantity of coal carbonized, thus landing him in a deficiency when the stock is worked out. I by no means say or suppose that any manager does this

intentionally; but where his directors or committee lay great stress on a large make per ton he is not likely to book too many coals—thus leading to the danger of booking too few. Not many things annoy me more than to find a deficiency of coals when the stock is worked out; and my orders are, "Whatever you do, take care to book enough coals. I shall not find fault if at the end of the year there is a moderate surplus."

Bearing on this point, I have taken some interest in comparing the statements of chairmen at meetings with the yearly results; and I have often found a very considerable discrepancy. The chairman has sometimes said they were making 10,400 feet, 10,500 feet, or what not, while the complete accounts showed a very different result, owing no doubt to the chairman's statement being based on the returns of a few weeks, which, from exceptional circumstances or under-bookings, did not correspond with the year's working.

This is evidently an intricate question, but there must be an "economical maximum" of production beyond which it will not pay to go. So far the balance seems to incline to a comparatively low make, though I agree with my friend Mr. H. E. Jones that, other things not being forgotten, a good make is one of the best of good management.

GEORGE LIVESBY.

South Metropolitan Gas Company, 589, Old Kent Road, S.E.,
Oct. 23, 1880.

SIR,—Referring to the article, on high yields of gas per ton of coals carbonized, communicated by Mr. George Livesby in your issue of the 12th inst., I altogether disagree with his calculations as far as gas companies are concerned whose coals cost as much and whose selling price of gas is as high as with us. I maintain that by making 10,300 feet of gas per ton of coals carbonized, instead of 9800 feet, and using cannel to bring up the illuminating power, we effect a clear gain of more than 1s. per ton of coal, and I would submit the following figures in proof:—

My coals are not of the best, and when making 10,300 feet of gas to the ton, I am obliged to use 6 per cent. of cannel, costing 30s. per ton, to bring the gas up to 15 $\frac{1}{2}$ candles. This percentage raises the price per ton of coals 1s. all round. But we gain as follows:—

The selling price of 500 feet of gas . . . = 2s. 0d.
Saving in labour = 0 4

Total 2 4

Or a gain of 1s. 4d. per ton.

I do not deduct anything for extra fuel, as I find no difference between the present time and when we made only 9700 feet of gas per ton of coals carbonized.

Buxton Gas-Works, Oct. 22, 1880.

SIDNEY E. STEVENSON.

THE APPROPRIATION OF GAS PROFITS AT WALSALL.

SIR,—In the JOURNAL of the 12th inst., you made a few remarks concerning our appropriation of gas profits, which I consider decidedly unjust to the ratepayers, who provide capital and manage the business at the lowest possible expense. You appear to think that they ought to do all this, and give the gas consumers the whole of the benefit.

Now, look at each side of this important question. The ratepayers borrow money upon their own property, and by offering such good security can borrow at 4 per cent. The ratepayer has the whole of the liability, and it has been said that the liability can be covered by the price of the gas; but during the electric light "scare" it was pretty clear that gas property went down, and if the electric light had been successful, would the consumers have compensated the ratepayers?

Now, gas consumers borrowing money to erect works for themselves, having no other security than the gas plant, must pay a very much higher rate of interest. Therefore, I think, the ratepayer is fairly entitled to a share of the profits equal to the gas consumer, for supplying capital, taking the liability in case of gas being superseded, and for the management.

The gas consumers of Walsall have for many years had the whole of the profits of the gas undertaking, and for quality and price have been served better than any other town. Now we are in a position to do something for the ratepayers without making a difference to gas consumers, and there is no wonder why they do not complain about the appropriation of profits.

I think you cannot satisfy your remarks, that the Corporation of Walsall, in dealing with the gas profit, without any consideration being observed between the contributors and recipients, and are robbing Peter to pay Paul. The real fact is, we satisfy "Peter" the gas consumer, and "Paul" the ratepayer and proprietor.

R. W. BROWNHILL.

Bentley Moor, Walsall, Oct. 13, 1880.

[We can only advise Mr. Brownhill to follow his own advice, and look at the other side of the question. We were under the impression that the gas consumers of Walsall, as in other towns having corporation gas-works, in reality bear all the capital charges of the undertaking, the ratepayers as a distinct body having only a formal responsibility which it is never intended should be a real charge upon them. If there were any danger of the investment failing to pay, it is difficult to believe that local authorities would recommend their constituents to assume the proprietorship of gas undertakings. Mr. Brownhill's remark as to the cheapness of capital raised on the security of the rates is not strictly true. Capital can be obtained on ordinary gas companies security as cheaply as when the ratepayers' help is invoked; cheaper when the heavy annual appropriations in aid of local rates, in the Walsall manner, are added to the actual payments for interest and redemption. Lastly, the proportion of receipts to allowances in the case of Bloxwich either means nothing, or it means that people who do not contribute to the revenues of the borough are relieved at the expense of those who do.—Ed. J. G. L.]

SALE OF SHARES IN THE DOVER GAS COMPANY.—On Thursday, the 14th inst., Messrs. Worsfold and Hayward offered for sale by auction, at Dover, 100 shares of the Dover Gaslight Company, 61 of which were sold at £15 12s. 6d. each, the remainder at £15 10s. each. The total amount realized by the sale was £1557 12s. 6d.

and leading the prisoner in, told him he wanted to go down to see the gas. Prisoner said, "Mr. James, you know that I have not used gas for the last two years." James, however, insisted on going down, and

in store; but it must be remembered that it was a source of safety to the Company to have a large stock in hand. The Manager took advantage of fortunate sales, and notably of late in reference to a cargo from Japan, which he purchased in dollars instead of pounds sterling. This was a great advantage to the Company. He thought the Shareholders had considerable satisfaction in feeling that they were safe in the hands of the Local Committee and their Manager.

Mr. W. H. LEE FRANK seconded the motion, remarking that there was a great future for Japanese coal, which was of excellent quality. The motion was carried unanimously.

Mr. RICE moved a vote of thanks to the Chairman and Directors, which was unanimously agreed to.

Mr. ALFRED WILLIAMS proposed, and Mr. FOREMAN seconded, a vote of thanks to the Secretary, which was also unanimously agreed to.

Mr. R. KING, in reply, said he hoped his services would continue to give satisfaction to the Shareholders.

The proceedings then terminated.

BELFAST CORPORATION GAS SUPPLY.

The Monthly Meeting of the Belfast Town Council was held on Friday, the 1st inst.—the Mayor (Mr. J. Browne, J.P.) presiding—when a report from the Gas Committee was presented, of which the following is an extract:—

The Committee are of opinion that the £50,000 now standing at the credit of the renewal and contingency fund, and £22,500 7s. 5d. out of the surplus profits of last year, should be appropriated to discharge the premium paid to the Gas Company on the acquisition of the works, and they recommend the Council to authorize this to be done. The premium so paid amounted to £186,550, leaving the prime cost, as appeared in the old Company's books, standing at £250,000. It being the desire of the Committee that the holders of gas mortgages falling due at the 31st of April next, that unless they renew their loans for periods of three, five, seven, or ten years, at 4 per cent., they will be paid off. Holders of mortgages to the amount of £10,120 were notified in April last that they would be paid off on the 31st of October, unless they would renew at 4 per cent. for terms of three, five, seven, or ten years. £15,850 of the said amount will be paid, the other mortgages having agreed to renew, and the Committee recommend that cheques therefor be signed, and they have arranged for new loans to like amount.

The annual accounts of the gas department were also presented, the following being some of the figures shown:—

Capital Account.

The total receipts were £189,813 14s. 11d.—viz., loans on mortgage, £140,598 (as per last year's statement); less fourth instalment paid Bank of England, £1,000, and £450 of sundry mortgages repaid, leaving £184,498; to which are added the amount borrowed during the year, £30,600, and the perpetual annuities of £2245 14s. 11d.

The expenditure to June last year was	£192,303 4 8
The additional outlay during the past year was	
Mains and service-pipes	£3,221 15 8
Coal-shed, complete (except floor)	5,983 2 10
Engines and exhaustors, valves and connections for same, and alteration of buildings	3,458 11 0
Coal storing and measuring machinery	4,001 7 2
Condenser	2,960 1 0
Purifiers, with all pipes and connections, valves, &c.	3,616 14 9
Retort-benches	1,737 14 11
Two station-meters, valves, and connections	1,306 10 2
Large lamps, lamp-posts, and governors	149 4 8
Miscellaneous	253 10 6
Meters	1,062 13 2
	30,040 18 1

Less amount appropriated out of surplus profits (previously standing at credit of renewal and contingency fund) to discharge of premium paid Gas Company on the acquisition of the works, £50,000 0 0	
Also amount appropriated out of the same for the year ending June 30, 1880	22,500 7 5
	52,500 7 5
Total	£139,813 14 11

Revenue Account.

Sales of gas*	£77,351 16 9
Less discounts	£160 16 8
" bad debts	47 9 5
	5,108 6 1

Public lighting and under agreements	£73,226 10 8
Residual products	10,121 16 1
Coal and breeze, less labour, &c.	£15,285 11 2
Tar	6,332 18 0
Ammoniacal liquor	4,854 10 11

Rents	26,573 0 1
Gas-rents recovered (formerly written off as bad)	75 3 0
	9 2 3

Total	£109,005 15 4
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Expenditure.

Coals (52,984 tons) including dues, cartage, unloading, &c.	£33,794 18 0
Purification and sundries (including labour, 2634 ss. 10d.)	1,700 9 5
Salaries of Engineer and Assistant	929 3 4
Wages (carbouring)	6,247 0 0
Repairs and maintenance of works and plant (including renewal of retorts), machines, apparatus, tools, materials, and labour	4,648 4 1
Coal used for steam-boilers	211 16 3
Distribution of gas—	
Salaries of Chief Inspector, Inspectors, and Clerks	954 3 4
Repair, maintenance, and renewal of mains and service-pipes, including materials, laying and paving, and labour	1,038 11 8
Repairing, renewing, and refitting meters	3,482 18 8
Public lamps—oil and gas supplied	2,483 5 7
Rents	135 0 0
Rates and taxes	2,870 9 3
Salaries of Cashier, Accountant, and Clerks, Office-keepers, &c.	1,823 6 8
Salaries of Collectors	823 6 8
Stationery and printing	178 3 9
Gravel and establishment charges and incidental expenses	353 6 4
Audit-fund	42 0 0
Law charges	10 18 0

Balance carried to net revenue account	£63,614 9 10
	45,391 5 6
	£109,005 15 4

* Gas sold	Cubic Feet,
" used on works, &c.	498,000,000
" unaccounted for	4,480,000
" made	518,019,000
	or 10,355 feet per ton of coal carbonized.

Profit and Loss (Net Revenue) Account.

The total of this account is £58,370 11s. 11d.; made up of balance from last year's account, £22,936 16s. 11d.; balance from revenue account, £45,201 5s. 6d.; and bankers interest, £51 18s. 6d. The above amount of £58,370 11s. 11d. is disposed of in the following way:—

Amount carried to renewal and contingency fund	£30,000 0 0
Interest on loans and annuities for the year ending June 30, 1880	19,596 8 1
Amount carried to sinking-fund	5,363 10 3
Amount carried to expenditure (see capital account)	21,500 7 5
Balance consisting of balance from last year's account	£22,936 16 11
Less carried to renewal and contingency fund	20,000 0 0
	£2,936 16 11
Net profit on year's working	£25,813 11 11
	£28,770 13 10
Less carried to sinking-fund	5,363 10 3
	£23,407 3 7
Less carried to expenditure	22,500 7 5
Total	£68,370 11 11

Renewal and Contingency Fund Account.

To the balance of this account from the previous year (£40,000) there was added from the profit and loss account, shown above, £20,000; the total (£60,000) being carried to expenditure—see capital account.

Sinking-Fund Account.

This account stands as follows:—	
Balance from last year's account	£15,075 16 11
Bankers interest	26 18 0
One year's interest on £15,075 16s. 11d., at $\frac{1}{2}$ per cent., less	651 10 3
banker's interest as above	
Amount brought from profit and loss account, viz.: 1 per cent. on amount borrowed, and 1-100th part of capitalized annuities	4,712 0 0
	£20,466 5 2

Of this amount, £15,103 14s. 11d. is carried to the extinguished loans account; £1225 of private mortgages repaid, £18,877 14s. 11d. to the Bank of England were repaid; leaving a balance of £2563 10s. 3d.

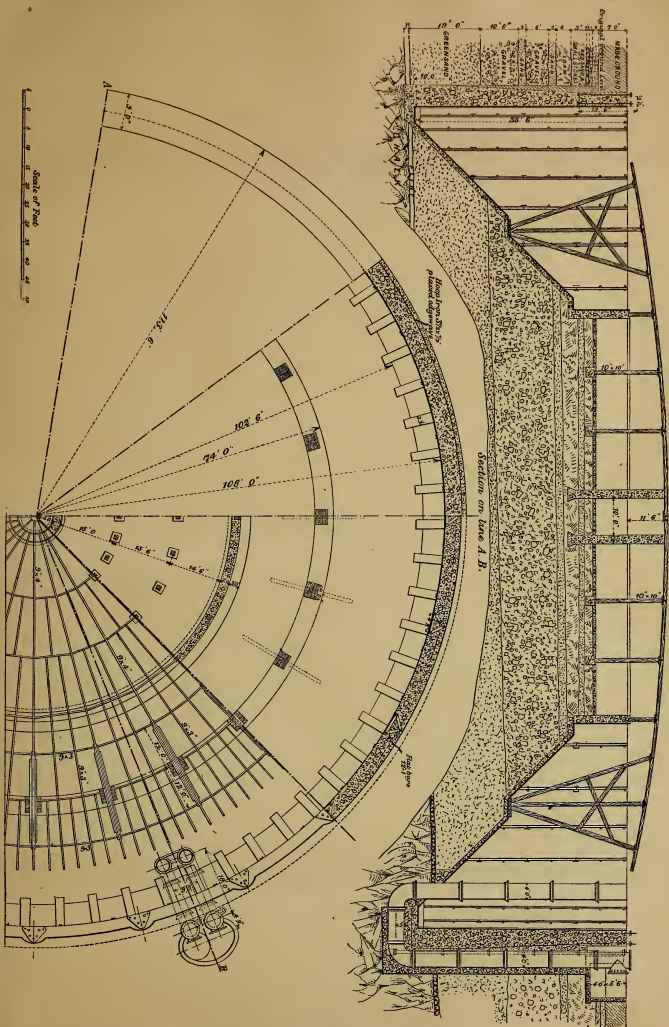
Balance-Sheet.

The debit side of this account was made up of the balances of the revenue, sinking-fund, and extinguished loans accounts; to which was added £14,381 14s. 11d. for sundry amounts due from interest accruing, new machinery, &c., including Treasurer (£7262 14s. 1d.); making a total of £35,754 17s. 3d.

This was balanced by the following items:—	£5,154 14 10
Cash at bankers (sinking-fund account)	
Value of stocks in hand—	
Coal	£4,306 5 0
Coal and breeze	375 0 0
Tar	230 0 0
Ammoniacal liquor	30 0 0
Sundry stores	4,742 11 0
Accounts due for gas	£9,183 10 9
Accounts due for meter-rent (arrears)	4 17
Sundry accounts for coke, tar, &c.	3,739 19 7
Sundry accounts for service-pipes	170 16 1
	13,099 3 8
Sundries—consisting of Council lamp account (£2945 7s. 4d.), Harbour lamp account (£424 10s. 4d.), &c.	6,092 3 7
Half year's taxes unexpired carried forward	1,735 0 0
	£35,754 17 3

Sir JOHN SAVAGE, in moving the adoption of the Gas Committee's report, said: Mr. Mayor, it is with a feeling of high gratification that I rise to move the adoption of the very important report now presented, and to make a few brief remarks, on the present position and future prospects of this gigantic undertaking, arising out of the last year's accounts, now in the hands of the Corporation. The quantity of gas manufactured has increased 7 per cent. since the year before—viz., for 1879, 513,970,000 feet, against 548,039,000 for the past year; and the loss in its distribution amounting to 8.25 per cent., against 7.49 in the preceding year. This difference, the Engineer (Mr. J. Stelfox) thinks, is accounted for by the fact that the gas was sent out at a slightly higher temperature than previous years, and I am inclined to see in this view by the circumstance that the actual quantity sold per ton of coal carbonized was as high one year as the other, whereas the registered make shows an increase of 143 cubic feet on 1879. It will be seen, Mr. Mayor, that, though the price of gas was reduced 3d. per 1000 feet, entailing a loss of £6000, our profits are only £1473 7s. less than the year before; the amount for 1879 being £27,316 8s. 11d., against £25,813 16s. 11d. This favourable result induced the Committee to recommend a still further reduction of 2d. per 1000 feet, thus bringing the price down to 3s. 4d. without meter-rent, against 4s. 6d. with meter-rent, at which it stood in 1874, and which is exactly 30 per cent. reduction since the works came into our hands. In my judgment those figures prove very conclusively the ability and the prudence with which this local industry has been managed; and that even corporations, when they set themselves properly to work, are capable of rendering great service to their fellow-citizens. The total profit since the works came into the hands of the Corporation are £38,407 3s. 7d., and a sinking-fund of £20,466 5s. 2d., or in all £108,873 8s. 9d. It will be seen that the expenditure on the works has been very heavy during the past year, amounting to the large sum of £30,040 18s. 1d. But this was only carrying out a portion of the expenditure detailed in my statement of March 13, 1879, amounting to nearly £100,000, to complete and thoroughly equip the works for their utmost capacity of 800 million feet per annum. The largest sum at that statement was for the new gasholder, which, it is expected, will cost in round numbers £40,000. In addition to this, there are still two sets of purifiers to be erected, costing £4000, and two additional scrubbers, £2000, which, with additional mains, will bring up the entire expenditure on capital account to fully £50,000. Now one of the most important items in this report is the fact that, after long and mature deliberation, the Committee came to the conclusion that it would be a wise and prudent policy to pay off, as occasion served and as soon as possible, the sum which the Council paid to acquire the gas-works—namely, £186,550. When the Corporation purchased them they stood as good *bona fide* value for £250,000; but the above enormous premium had to be paid in order to their acquisition. No wonder Lord Redesdale exclaimed that we had a salt pennyworth, and doubted if the works would ever pay. Well, they have paid, and will yet pay, a larger sum, if prudently and wisely managed. The Committee decided that the surplus profits, independent of next year's 7s. 5d., should be so applied, and the balance of £907 carried to next year's account. This served the double purpose of squaring off the expenditure to the 1st of July to a point, and of reducing our liabilities to a little less than £40,000. And inasmuch as we have still unexercised borrowing powers to the extent of £40,000, we have sufficient ways and means to pay for the holder without going for further

SOUTH METROPOLITAN GAS COMPANY—OLD KENT ROAD WORKS.



CONCRETE TANK (AS ORIGINALLY DESIGNED), 216 FEET BY 66 FEET.

George Lavery, M Inst C. E., Engineer.



borrowing powers, which, in other circumstances, we would most assuredly have had to do. Reverting to the expenditure for the past year, I may remark that one of the most important items is the new coal-shed, which is quite a sight to see, and is capable of storing 20,000 tons of coal. It is thoroughly permeated with a network of rails, and enables the coal to be delivered into the shed with little or no manual labour. Of course, it is impossible to bind our successors, but I would strongly urge the propriety of continuing to allocate the surplus profits until the remaining £100,000 of premium is entirely wiped out, leaving the works, in four or five years, at an annual cost of £30,000, and the possibility of producing 300 million feet of gas per annum, and other things being equal, ensuring a profit year by year of from £30,000 to £50,000. This would be a proud position to occupy, and is certainly now within view of being consummated. Mr. Mayor, the accounts placed in the hands of the Corporation this morning exhibit a concise manner the state of the gas industry at the present moment, and this completes the sixth year since they came into the hands of the Corporation. I really must congratulate the Council on the proud position in which they stand. The works, as you are aware, are in the best condition, with the most improved machinery. In concluding his speech, Sir John Savage said it would be borne in mind that this time twelve months ago, when he had the honour of addressing them, he asked permission of the Council to retire from the chairmanship of the Gas Committee. They kindly asked him to continue during the remainder of the year. He had not only done so, but he had continued to do so with vigour and ability, and he had been able to do so, he felt it had now come to this with him, that he must conclusively and definitively retire from the chairmanship of the Committee, not that he did not find the greatest possible pleasure in attending to the interests of the Committee, but he felt that the "shades of evening" were thickening round him, and for his health it became absolutely necessary that he should retire.

Mr. CORBETT seconded the motion for the adoption of the report. He said he hoped Sir John Savage would reconsider the question of resigning the chairmanship of the Gas Committee. There would be a great many things that he could do, and he did not see how they could do without Sir John's guidance.

Mr. MR. GRACE said he had heard many reports from the Gas Committee, but he never heard one that concurred so much with his views as the one now submitted. He never could feel there were any profits made so long as Sir John was on the Gas Committee, and he was sure that the change in the mind of the Committee, that they were reducing the debt, and this was a right and proper course. As regarded the remarks made by Sir John Savage about ceasing to be Chairman of the Committee, when he mentioned his intention nearly a year ago, he (Mr. Mr. Grace) said that Sir John was, becoming a great deal better, and that Sir John was happy to say, was now in vigorous health, and so long as Providence continued him in it he did not think he should cease to give his valuable assistance to the town. He had certainly done great service, and he did not think for a moment the Council would entertain the idea of resigning the chairmanship of the Gas Committee. Sir John was a member of the Council, and he did not think that during those four years he ought to bring this subject before the Council again. He would not be in the least surprised if, under the care of Sir John Savage, they should bring the price of gas down to 2s. per 1000 feet, and if he did they would give him a handsome testimonial.

Mr. T. H. BROWN said he was still in hope that they would have a large covered market built. It was proposed now to take £82,500 of the gas profits of other years to wipe off the charge on premium paid to the old Gas Company. He was quite willing that part of the amount should go to this purpose, say £30,000, and the remainder be spent on other matters, say the erection of a covered market, and to keep down the taxation of the town. They should also retain a portion of the money in hand. He was sure they would all regret if Sir John Savage retired from the chairmanship of the Committee—an office which he had so worthily filled. Sir John was a great help to the Council, and he was sure that Sir John was now in vigorous health, and so long as Providence continued him in it he did not think he should cease to give his valuable assistance to the town. He had certainly done great service, and he did not think for a moment the Council would entertain the idea of resigning the chairmanship of the Gas Committee. Sir John was a member of the Council, and he did not think that during those four years he ought to bring this subject before the Council again. He would not be in the least surprised if, under the care of Sir John Savage, they should bring the price of gas down to 2s. per 1000 feet, and if he did they would give him a handsome testimonial.

The Mayor said he much regretted to hear the statement that Sir John Savage had resigned the chairmanship of the Gas Committee. Sir John had been the principal mover in the whole affair, and he had taken the greatest trouble, time, and labour to bring the gas-works to their present state of efficiency. Just now they were laying out a great deal of money, and if they should lose his (Sir John's) services the town would be at a great disadvantage. He was sure that Sir John would devote as much time to their interests in the future as in the past; but they would ask him to retain nominally the chairmanship of the Gas Committee; his advice and assistance would be so valuable to the Corporation. He thought if they would ask Sir John to do this, it was as much as they could expect. With regard to the remarks of Mr. Browne, the matter, he might say, had been discussed again and again in the Committee, and they came to what he (the Mayor) thought a wise resolution—to take £80,000 and pay off some of the old debt.

Sir JOHN SAVAGE said he might say, in response to the kind remarks made by the Mayor, that he was very glad to hear that the Council were so anxious to retain his services, and that he was sure that the Council would be able to do so. He was sure that the Council would be able to do so, and that he was sure that the Council would be able to do so.

The Mayor said that he thought he spoke the mind of the Council when he said that Sir John Savage was a great help to the Council, and that he was sure that Sir John would devote as much time to their interests in the future as in the past; but they would ask him to retain nominally the chairmanship of the Gas Committee; his advice and assistance would be so valuable to the Corporation. He thought if they would ask Sir John to do this, it was as much as they could expect. With regard to the remarks of Mr. Browne, the matter, he might say, had been discussed again and again in the Committee, and they came to what he (the Mayor) thought a wise resolution—to take £80,000 and pay off some of the old debt.

The motion was then put and carried, and the report adopted.

THE DISPOSAL OF THE SEWAGE OF GLASGOW.—In the course of the report just published, of the deputation appointed by the Glasgow Town Council to inquire into the question of sewage disposal in the towns in England, the following passage occurs:—It is agreed within the terms of our remit to recommend a definite scheme for the disposal of the sewage of Glasgow, but we may state our views so far as to indicate in a general way what we consider the best course of procedure. We are of opinion that the sewage of the north and south sides of the river should be treated separately—that on the north be taken to Dalrymple by a high-level and a low-level sewer; while that on the south, the whole of which will require to be pumped, should be taken as far down the river as practicable. We are decidedly favourable to the intermittent system of precipitation, distinguished from the constant-flow process; but we leave the nature of the precipitant to be employed for future consideration, and the same construction of tanks and other apparatus is required for all the various systems. Of course, we expect that all the towns round Glasgow will also be compelled to defecate their sewage; for it would obviously be absurd for this to be done in Glasgow, and the same process, cost, if other towns were permitted to introduce their filth without being cleansed."

MANCHESTER CORPORATION GAS SUPPLY.

At the Meeting of the Manchester City Council on Wednesday last—the Mayor (Alderman Paterson) in the chair,

Alderman LAMM moved the adoption of the annual report and accounts of the Gas Committee, as given in the Council for the 15th inst. (contd. p. 573). In doing so he said he was sure the Council would be pleased to find the Committee were able to present such a good balance-sheet, especially after the trying year through which they had just passed. Although the number of consumers had been 1000 less than in the previous year, the gross profits for the twelve months were £111,000 against £96,000 last year. The extra fund had enabled the Committee to meet all their engagements, including the street lighting. The Council would see that those engagements were not mere bagatelles. They comprised £52,000 for improvements in the city, £39,000 for the sinking-fund, £27,000 for depreciation, and £22,000 for interest. He had stated that the number of consumers had shown a falling off during the past year, but at the same time the amount of gas consumed had been the greatest on record. There had been 240,000 tons of canal and coal carbonized, against 232,000 tons last year. Reference had recently been made in the newspapers to the quality and price of the gas supplied in Manchester and Salford, and the question had been asked why they could not in Manchester make gas as cheaply as was done at Leeds. His answer to this question was that they could, if the gas consumers would only be content and not grumble if the Committee supplied them with a similar article to the best that could be produced elsewhere, but he was sure that no company were boasting that they could make gas without any canal. It was not his place to find fault with them, if consumers were satisfied. He was very sorry to make comparisons, but the Committee were obliged to do it in self-defence. He maintained that the gas produced in Manchester was of the best quality, and that the price was as low as possible, far as possible, he hoped the Council would never allow the 10 per cent. to the Improvement Committee to be interfered with. Every improvement that had been made had increased the assessment of the city, and had given great facilities to trade and commerce. He moved, pursuant to the resolution, that the Committee be thanked for the report, and that the price of gas be reduced as follows:—Within the city, from 3s. to 2s. 10d. per 1000 feet; outside the city, from 3s. 6d. to 3s. 4d. per 1000 feet; beyond the River Mersey, and district of New Moston, from 4s. to 3s. 10d. per 1000 feet; and the price charged for gas supplied to the public lamp beyond the city, reduced 2s. per lamp per annum.

Mr. HARWOOD seconded the motion, and it was agreed to.

THE WATER SUPPLY OF DUBLIN.

At a Special Meeting of the Dublin Municipal Council, which was held on Monday, the 18th inst.—the Lord Mayor in the chair—a report of the Water-Works Committee, on the subject of carrying out an extension of the Dublin Water Supply to Rathfarnham, was presented. It stated that the Committee had received considerable support for some time from numerous applications to extend the Varty water supply to Drumcondra, Rathfarnham, Milltown, and other places in the vicinity, and having directed the Engineer to prepare plans and estimates of the probable cost of laying the necessary mains, and the income which would be derivable from supplies of water to the inhabitants along the line of pipes, he submitted a report on the subject, which stated, amongst other things, that he strongly recommended the work be immediately undertaken. He had made two estimates, the first being for the supply of the districts mentioned from the existing lines of mains, and the amount required to be expended would, he said, be £4500. This would afford a good and efficient supply of water. The second estimate was for laying a 15-inch pipe from the Stillorgan reservoir to Drumcondra, a distance of about 5734 yards, and to take branches off this to supply the adjacent districts. This main would enable the Corporation to supply the Rathmines township as well. Such a system of pipes would be a great help to the Corporation, and it could be carried out. The Committee further reported that they had received the opinion of the Engineer, and recommended the Council to sanction the extension of the water system direct from the Stillorgan reservoir.

A further report of the Water-Works Committee, in reference to the filtration of the Varty water, came up for consideration. The Committee stated that their attention having been directed to some observations of the Royal Sanitary Commissioners with regard to the filtration of the Varty water, they had obtained the following report from Mr. Parke Neville, C.E., the City Engineer:—

Gentlemen, I have to report with regard to the remarks made in the Report of the Royal Sanitary Commissioners, Dublin, relative to the water supplied from the Varty water, that I will have every precaution taken to render the filtration as perfect as possible. I have studied, for a long period of years, the construction of water-works, and I am convinced that the water supplied from the Varty water, as it is now, would be improved, and I have thought it best to direct to the City Engineer, Mr. Parke Neville, to make the Varty works, including the filters, perfect; and I may add that I have visited most of the large water-works in the United Kingdom, and know of none superior to the Corporation works.

At Mullingar, where the water is taken from Loch Katrine, and is more coloured than the Varty (the guttering-grounds being chiefly covered with peat soil on the mountain sides), the water is not filtered, but simply passed through copper gauze wire screens at the Mullingar works, the same as we do at the Stillorgan reservoir. At Manchester I think there is no filtration; while at the Birkenhead works, Liverpool, the water is passed through sand filters like yours. Until the three new filters were constructed, the water was not filtered, but simply passed through the old filters, and the consumption of water being larger than contemplated when the works were designed; but now we can pass the water through more slowly, which secures better filtration; and the water will remove all colour, and will be as pure as the water from the Varty, Loch Katrine, &c., although the water is soft and perfectly pure; but, as I have before stated, I will have every precaution taken to secure the water as pure as possible. I have thought it best to direct to the City Engineer, Mr. Parke Neville, to make the Varty works, including the filters, perfect; and I may add that I have visited most of the large water-works in the United Kingdom, and know of none superior to the Corporation works.

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I am convinced by saying that every means will be taken by the officers of the water-works department to improve such supplies as are under consideration, when opportunities occur.

On the motion of Alderman CAMPBELL, the reports were adopted.

THE BIRMINGHAM GAS-WORKS AWARD.—At the meeting of the Oldbury Local Board on Friday, the 15th inst.—Mr. B. T. Sadler in the chair—the Clerk produced a copy of the award for Oldbury in the Birmingham gas arbitration, which set forth that the amount payable by the Oldbury Local Board, in respect of the works within their district, was £32,750. The Clerk pointed out that the Birmingham Corporation had been ordered to pay the costs of the application for extension of time.

short time so argument the demand for supplies of gas, that all the retorts in the works could be kept in constant use in summer as well as in winter, in daylight as well as in darkness. Of course it would be for each to consider his own special conditions in offering inducements to consumers; but I should be inclined to suggest that stoves, like meters, should be let out on hire, with the option to the user to purchase right off or by making so many payments. Or, again, arrangements might be made with landlords of houses of suitable size to supply the kitchen, so that tenants, in moving from one house to another, would not require to sever connections in order to remove the stoves. When once the public come to consider how cheaply, how cleanly, and how easily they can, by the use of gas stoves, cook their daily food, I am certain we shall see fewer complaints about the want of suitable cooking works. It might be a consideration for companies if they desired to stimulate the industry of gas-making, whether they should not allow a certain percentage of discount to all consumers who use gas both for cooking and lighting.

Then there is another consideration on this same topic. Through the perfection of the heating system, gas for the future is more largely run upon. Those who have been accustomed to the open fire are, no doubt, prejudiced in its favour, and this, too, although they are fully aware that one-half of the coal put upon the fire passes away without doing any good in the way of heating. The prejudice of those people must be respected, but the same time it must be broken down, and the best way to do this is to encourage the introduction of gas-heating stoves. When the air in a room is raised to a comfortable temperature, and suitable ventilation provided for carrying away the air vitiated by breathing, we may expect not only greater comfort to the people, but more healthy houses. And in fostering and encouraging the introduction of such stoves, gas companies will not only be forwarding their own interests, but will materially contribute to the welfare of the communities amidst which they are placed.

There is another most important way in which the use of gas should be encouraged—I mean using it as a motive power. You will have seen that in some of our magnificent churches, gas engines have been invented, and are now being brought under the notice of the public. Where only a small amount of power is required, I know of no motor that will answer the purpose so well as a good gas-engine. It can be applied to so many various purposes, such as driving printing presses and sewing machines, and, &c., and in many cases it may be used with great safety and economy in some of our churches, for driving the organ bellows.

And now, gentlemen, you will see, from the few observations I have just made, that many and various are the ways in which gas can be used, and when the people come to use it, as shortly I am convinced they will do, it cannot close any of the domestic uses of gas, but it will be an account of the larger consumption, to produce the article at a much cheaper rate than it has ever been in the past.

I might, gentlemen, have said a little on some of the other matters connected with the manufacture of gas, such as condensing and scrubbing, retorts, leadage, meters, &c., but I have not time to do so, and I have no doing so, as several of these subjects will be handled, and I have no doubt ably handled, by some of the members of the Association, at a later stage of the present proceedings; and from the discussions that will follow I hope much information will be obtained on these subjects. I cannot close my remarks, however, without expressing my appreciation of our Association; and it gives me great pleasure indeed to be able to congratulate you on its prosperous condition. During the past six months no deaths have taken place amongst our number, and no calls whatever have been made upon our Benevolent Fund. This fund, I am glad to inform you, still remains untouched, and from information I have received from the Treasurer, I am also glad to be able to state that the managers or working fund is in a very healthy state. The General Committee have been most assiduous in their labours during the past half year, and to them we are indebted for the prosperous state in which our Association stands.

(To be continued.)

THE NOTTINGHAM CORPORATION SEWAGE FARM.

On Thursday, the 14th inst., a number of members of the Nottingham Town Council, with some of the chief officials, paid a visit, at the invitation of the Sewage Farm Committee, to the Corporation Sewage Farm at Stoke Bardolph, on the banks of the Trent. Among those present were the Mayor (Sir J. Oldknow), the Chairman of the Committee (Alderman Taylor), the Town Clerk (Mr. S. G. Johnson), the Consulting Engineer to the Corporation (Mr. M. Ogilvie Tarbotton), the Medical Officer of Health (Dr. Seaton), and the Borough Engineer (Mr. Brown). The party left Nottingham by train shortly after eleven o'clock, and in the course of the outward journey the line of the great sewer, which lies close to the railway, was pointed out. On arriving at the Stoke Lane crossing the party alighted, and proceeded to inspect the works in connection with the history of the sewer, and of the sewage works generally, will be interesting.

The general question of the disposal of the borough sewage, which it has been sought to solve in this farm, has been before the public and the Corporation Council for a period of over 20 years. In 1859, Mr. T. Hawley, in conjunction with the Trent Navigation Company, proposed a system of principles of intercepting and outfall sewers—a work which was duly accomplished by them under the directions of the then Health Committee. Nothing more was done for some years, however, till the Corporation were informed by the riparian owners to take some steps for the alleviation of the nuisance which was caused by the depositing of sewage in the River Trent. The subject came before successive committees of the Corporation, and ultimately the Acts of Parliament which dealt summarily with the question of the pollution of rivers were passed, the Council being thereby obliged to take rapid and active measures to dispose of the town sewage otherwise than allowing it to flow into the river.

In 1871 the matter was further pressed upon the attention of the Corporation by the riparian owners and also by the Local Government Board, which drove the Council to promote a united scheme with the outlying parishes, and to carry out the necessary works, but to deal with the sewage of the locality generally. This led to the formation of the old Leen Valley District Sewage Board, which was created under an Act of Parliament passed in 1872, and which united Nottingham in one body with the upper districts of the Leen Valley for the purpose of taking up the sewage question. The Board now have executed various works necessary for a united system to deal with the sewage. The first act of the new Board was to complete the sewerage of the Leen Valley, which was done at a cost of about £50,000, the sewage being thereby intercepted throughout the whole of the valley of the Leen, from the north end of Bulwell to the south end of Nottingham, and being carried by a main sewer along with the flow of Nottingham. The next operation was to deal with the sewage in a district in 1875 Mr. Tarbotton, the Engineer to the Board, made a report in which he recommended that the whole of the sewage should be dealt with in altogether the modern mode—not by the obsolete forms of

chemical or precipitation processes—and that it should be carried to productive land, whereby it might be purified and whereby certain agricultural results might be attained, so as to some extent to repay the cost of manipulation. The report was deliberated over by the Leen District Board at considerable length, and submitted to several engineers and agriculturists of eminence.

About the same time the session of the borough was determined upon, and in 1877 the functions of the Leen Sewerage Board were merged in the Nottingham Corporation, who undertook the completion of the works which had been designed and determined upon by their predecessors. These works consisted in the construction of a gravitation outfall sewer from Nottingham to the land selected by the Board, and approved of subsequently by the Town Council, at Stoke Bardolph. The character of a comparatively completed engineering character, but generally are simple in their principle, and consist of an outfall sewer from Sneinton to Stoke. Into this outfall sewer the higher portions of the town district of the town will deliver their sewage into it, while lower portions of the town will deliver their sewage into it by pumping, which will be carried out in the Easterfort, dealing with the whole of the sewage brought down the Leen Valley from Bulwell and Nottingham. The sewage will therefore be brought partly by gravitation and partly by pumping to the main gravitation sewer, and thence it will flow down to the fields. A large outfall sewer has been constructed at a cost of £35,000, commencing at Sneinton and passing through the Colwick Hills by means of a tunnel two miles long at the eastern extremity, delivering its contents upon the land at Stoke. This land consists of 638 acres 22 perches of the Leen Valley, and is generally covered by the ordinary crops, and for the reception and purification of the whole of the sewage of the district. Since the completion of the sewer the land has been laid out on the most modern and scientific principles for the reception of the sewage. About five miles of main carriers have been constructed of a concrete in the form of a large drain, and the sewage is carried in this drain, when the works are completed, convey the sewage to the different portions of the farm. Subsidiary carriers will then distribute the sewage over the land for the cultivation of the various crops. About 350 acres have already been laid out for the reception of sewage, and at the present time all the sewage of the town is carried to the district, the borough is capable of being passed over and purified upon the land.

It has been found necessary to erect large and elaborate farm buildings for the purpose of the operations, which are, of course, in excess of those usually required by ordinary farmers. These buildings consist of stabling for about 200 horses, sheds for about 80 cows, pigsties, barns, cart sheds, and implement sheds, a complete system of water supply, and workmen's offices, and all the various buildings attached to an extensive farm. These have been constructed, and are now in full operation. Mr. Avis is the Farm Manager and Bailiff, residing at the buildings, and from his practical knowledge of the course of the sewage farm and as a general agriculturist he is considered specially competent to undertake all the heavy and responsible work which will devolve upon him. He has already proved his capacity by the magnificent crops, particularly of potatoes and wheat, which have this year been produced, partly by sewage cultivation and partly in the ordinary manner. The farm is capable of receiving the sewage of the population of the double the number of the present time, and if the reports of the Royal Commissioners and the advice which has been given by the collective Sanitary Commissions during the last 20 years may be at all relied upon, the sewage of the borough may be really purified as it is appropriated for fertilizing purposes upon this farm for the next 70 or 80 years to come.

The cost of the works, it must be understood, should be separated from any of the operations which are common to the sewerage of the borough at large. The whole cost of the outfall works, including the preparation of the land at Stoke, its drainage, the farm buildings, levelling, the main carriers, and the other works incident to an inseparable part of the sewage, up to the present time has not exceeded £47,000. It is probable that to complete what has been undertaken about £30,000 more will be required to be expended, making the total about £107,000, which is the amount of the cost of the works which have been laid out by the Leen Valley District Sewerage Board and the Corporation of Nottingham. Apart from this, however, it must be expected that as the borough extends the outlay will be correspondingly increased. It is noteworthy that up to the present time no money has been spent in parliamentary or other litigation. The expenditure has been necessarily very in the seasons, and depends on local difficulties in respect of soil and sewage, but it is hoped and believed that the annual loss to the borough will not exceed 2d. or 3d. in the pound; and when it is remembered that in towns like Birmingham, Leeds, and Blackburn, the ratepayers are paying 5d. or 6d. in the pound for the disposal of their sewage, it may be thought that Nottingham is comparatively fortunate.

Just beyond Stoke Lane the gravitation sewer ceases and becomes merged in the main carrier. Here Mr. Tarbotton took the party into his charge, and from point to point as they afterwards proceeded explained everything that was seen, and that needed explanation. The drainage was one of the matters. This is carried in a series of drains, but it is much deeper than usual—6, 8, and even 10 feet deep. The natural formation of the farm, roughly speaking, is saddle-backed from south to north, as the valley trends at that place; and, in conformity with the natural principle of drainage, it has been thought proper to drain both ways, and to run it from its eastern end to the west, and to run it in days of shallow drainage, one dyke running along the north-west side of the farm, crossing the railway, and joining the Trent farther down the valley after re-crossing the river. A dyke of pretty much the same character ran along the other side of the farm, and also emptied itself into the Trent. The latter dyke, however, has been altered, but the former has been deepened very considerably and provided with a concrete bed. Its course has also been changed, so that instead of crossing the railway twice, a way has been made for it along the Trent, and the dyke has been obliterated for that. The minor details of the drainage have not been overlooked. The pipes employed are of the best manufacture, and far superior to those ordinarily used for agricultural purposes, they being intended to be as permanent as such things can be. The smaller drains do not run at right angles to the main drains, but the direction in the direction of the flow of the water. The farm is not equally drained, however, the centre portion having pipes laid at a distance of only 44 yards, while the extremities of the farm are, or will be laid with pipes at double that distance. Mr. Tarbotton, in the course of the inspection, explained why the main carrier was so high out of the ground, being so placed at a much greater expense than would have been necessary had it been fixed at a lower level. It was that it might be able to dominate the whole of the farm, which varies considerably in its level, and which could not otherwise be supplied with sewage by filtration. The crops growing attracted a large amount of attention, and the greater portion of the district was in a much greater degree of cultivation.

After the tour had been completed, however, the party proceeded to the farm buildings, which were examined, the dairy exciting considerable interest. Here luncheon was served, and among the toasts proposed were those of "The Health of Alderman Barber," the Chairman of the Sewage

Farm Committee, and "The Health of Mr. Tarbotton," the Engineer to the Corporation.

Mr. TARBOTTON, in acknowledging the compliment paid to him, said he was very pleased indeed that the Council had honoured the works with a visit. He could only say that the works had been carried out to his personal satisfaction. They had before them an important work, for which there was an absolute necessity, and which had been spoken of all over the country. It was a work of sanitary advantage and improvement, and one which was imposed upon them, not by their own wishes, but by the law of the land. The undertaking involved great anxiety on his part, and also on the part of those who helped him, and whose names he wished to acknowledge. He had to say that the works had been executed in a thoroughly proper manner, and also that he had great satisfaction in being able to state that he did not think, with the experience which he had had for many years, and with all the difficulties which had been expressed, that if he had the work to do again he should alter a single thing, or do a single thing different from what had been done. He spoke very highly of the Farm Manager, and said of course the farm would never pay its expenses—it was not intended to do so. When the Council undertook it they were not making gas or selling water, or doing any of those things which they did from time to time, and which produced large profits. They had to deal with a nuisance, and to abolish it with the least expenditure of money.

The company shortly afterwards dispersed.

ON THE THERMAL POWER OF GAS HEATING APPARATUS.

By Mr. R. BRIGGS, C.E., of Philadelphia.

(From the *Journal of the Franklin Institute*.)

At the recent meeting of the British Association of Gas Managers a paper was presented by Mr. J. Travers of Cornwall on the thermal effect of gas when employed in heating or cooking, from which the following is extracted. Mr. Travers gives the result of a number of tests made in "a plain, practical method, such as may be applied to the doings of every-day life;" that is, tests made without the attempt to obtain exact experimental results, but merely to exhibit the probable heat effect of coal gas for domestic purposes. His preliminary tests were upon the evaporating effect of coal gas of various qualities by means of an apparatus which we are left to suppose was similar to a gas-cooking stove, with no attempt to utilize the entire heat of the gases of combustion, which may be assumed to have been allowed to escape in the open air, in the usual way, without condensation of the vapour of water generated by the burning of the hydrogen of the coal gas. The apparatus employed for producing the coal gas "was capable of carbonizing 90 cwt. of coal per day," which may be set down as producing 15,000 cubic feet of gas in that time. He consequently had distinctive specimens of gas to test, and Scotch canal, Newcastle and South Wales coal was experimented with, giving the following results:

Coal.	Illuminating Power.	Water Evaporated.	Gas Consumed.
Canal	24.0 candles	1 gallon	18.50 cubic feet.
"	22.0 "	" 1 "	" 19.75 "
"	20.0 "	" 1 "	" 20.50 "
Newcastle	16.5 "	" 1 "	" 21.75 "
"	14.5 "	" 1 "	" 22.00 "
"	12.5 "	" 1 "	" 23.00 "
South Wales	10.5 "	" 1 "	" 28.00 "
Do. do. and 20 per cent.	14.0 "	" 1 "	" 23.50 "

In the *Journal of the Franklin Institute* for April, 1878, will be found a paper by the compiler of this article, computing the results of combustion of coal gas, wherein it was shown that the theoretic heat effect of coal gas of specific gravity .426 was, closely, 622 units where the vapour of water formed in the combustion was permitted to escape uncondensed. It may be seen, here, that when the vapour is condensed to water at 70° Fahr., the total heat units from 100 lbs. of gas coal of the specific gravity of .426 are 2,154,350 units, while those from 1 cubic foot of coal gas at 70° are 690 units, with close approximation. It follows that about 0.7 of the total heat effect possible (at 622 units) was utilized by Mr. Travers's arrangement. Newcastle coal gas of specific gravity .426 was used.

It will be noticed also that, with the same method of testing, the heat effect increased in some measure with the illuminating power. As the illuminating power increases or diminishes with the quantity of carbon present in "luminants," and also as the specific gravity, this change can be attributed to the superior quality of the flame, and not to the gas compared with the hydrogen flame, an intensity nearly as 3 to 2 in favour of carbon (18.298 to 12.764).

Besides these practical tests of different qualities of coal gas, Mr. Travers further instituted a comparison of results from such burners as are found in gas stoves in general, using Newcastle gas coal of 16 candles, as a standard of average gas at present supply, in all the tests.

Thermal Units per
Cubic Foot of Gas.

No. 1.—Cooking stove fitted with a Bunsen burner provided by a ring of 12-inch wrought-iron pipe with jet-holes 1 inch apart gave	244
No. 2.—Boiling stove, consisting of single burner 9 inches diameter, made of 4-inch pipe, jets 4-inch apart	260
No. 3.—Hotplate, consisting of three rings, each 6 inches diameter, jets 4-inch apart	290
No. 4.—Like the above, rings 4 inches diameter	310
No. 5.—Cooker formed of bars of 1-inch wrought-iron pipe, jets 4-inch apart	338
No. 6.—Concentric burner, consisting of a double row of rings one inside the other, 6 inches diameter	380
No. 7.—Burner, same construction as above, but 4 inches diameter	408
No. 8.—Solid flame burner	450
No. 9.—Wallace's burner adapted for domestic purposes	480

The Wallace burner here referred to is constructed so that gas-jets escape across an aperture like an atomizer, and the mixture of gas and air is more intimately effected than with the other burners. It being almost certain that in all these instances the combustion was perfect, as the offensive nature of incompletely consumed gas is at once observable, it can be said, on the whole, these tests exhibit the improper control of air supply, or inadequate surface of the vessel receiving heat, or the incomplete contact with that surface, conditions within the province of the gas-stove makers to regulate, where the best ultimate effect to be anticipated from gas stoves is from 0.7 to 0.8 of the theoretic effect—say from 435 to 500 units of heat per cubic foot of gas. In the ordinary economy of coal as fuel in a kitchen range may be taken at 5000 units, the remainder of the heat escaping up the chimney; whence a cubic foot of gas is of equal value to about 1-12th to 1-10th of a pound of coal. Unfortunately for the coal exhibit in this statement, not 1-10th of the heat given out in the range is in any day is expended in cooking,

and it is only in the faculty of warming the room and for heating water that coal demonstrates its economy over coal gas as a fuel.

The foregoing assumption as to comparative value of coal and gas as fuel can be reduced to dollars and cents as follows:—

2240 lbs. of anthracite coal, at 5000 units = 11,200,000 units, present value 5 dollars.

3000 cubic feet of gas, at 470 units = 1,410,000 units, present value 6 dols.

Ratio of heat value of anthracite coal to that of city coal gas = 7 to 1. Mr. Travers further describes his experience with burning luminous flames in the production of heat, giving as an instance, as therein a stove "from one of the best makers was placed in a low-lying district, and the day pressure was not sufficient, with the result that the Bunsen burner, which formed the heating ring of the stove, frequently fired back."

"To increase the pressure was out of the question, and to meet the case, the flame was extinguished from a non-luminous to a luminous one, of course effectually avoiding the risk of firing back. The consumption of gas was not increased by the alteration, for much of the heat that was before lost by conversion is now converted into radiant heat. Bunsen burners, to be used for heat-giving in fire-places are [says Mr. Travers] to my mind, and for the reasons above given, a mistake; for, unless special arrangements are made, over 90 per cent. passes off in the shape of convected heat."

There exists a common misapprehension of the heat effect of burning a mixture of gas and air, which produces a non-luminous flame as compared with that from the burning of the stream of gas in the ordinary way of lighting. Either of these ways will clearly evolve an equal amount of heat from equal quantities of gas perfectly consumed. But the perfect combustion is ensured by the Bunsen arrangement at times and under conditions when it certainly would fail with the common burner. Where the flame of a simple gas-jet is brought in contact with any cold body, or cooled by radiation from any cold body near to it, it is likely to be struggled and to create no small quantity of unconsumed particles of carbon, but also produce a large proportion of partly burned carbon, or CO, in the gases of combustion. This last product will follow an inadequate supply of air to the gas. Thus a sheet of gas emerging from a horizontal surface of perforated plate or wire gauze will burn with a non-luminous flame, and the products of combustion, a mixture of carbonic oxide in the products of combustion. The heat expended in the production of light is quite inappreciable, as is established fully by the absorption of light generally with inappreciable evolution of heat, and it is seen that the reasons above stated show the only superiority of the Bunsen flame over the luminous one.

ON THE SOLUBILITY OF CARBON DISULPHIDE IN WATER.

By Mr. W. T. PAGE, of Norfolk, Va., U.S.A.

(One of the "Notes of Work by Students of Practical Chemistry in the Laboratory of the University of Virginia.")

Communicated to the *Chemical News* by Professor J. W. Matlej.

In most of the standard text-books on chemistry it is stated that carbon disulphide is "insoluble in water," "not sensibly soluble," or "nearly insoluble." It must have been often noticed that water shaken up with the sulphide acquires its odour, and hence some degree of solubility might have been inferred. The only attempt on record, so far as I know, to determine accurately to what extent solution really takes place, is that of Sestini, who found in a single experiment that 90 cwt. of CS₂ shaken up with 8.69 litres of water at 20° to 25° C., diminished by 11 cwt. in nine days, by 1.4 cwt. in the next three days (in diffuse light), and by 0.6 cwt. in five days more (in the absence of light). He states that a part of the sulphide was decomposed, and that the coefficient of decomposition was, in the light, 0.35; in darkness, 0.12, without giving any information as to how these determinations were made; and hence concludes that in this experiment 7.85 cwt. of CS₂ had been dissolved, or about 1 part in 1000 of water by weight. This should be, more accurately stated, 1 in 873.

Mr. Page employed pure water, deprived of air, by long-continued boiling and cooling, and the water was placed in a well-stoppered bottle, the stopper from another like flask just before removal from the lamp. The stopper being removed for a few moments, recently purified carbon disulphide was introduced to the extent of two or three cubic centimetres (more than the water present could dissolve), the vessel was expelled from the very small remaining space of carbon disulphide vapour, the well-fitted stopper was inserted, and as a further precaution against any entrance of air, the stopper and upper part of the neck of the flask were surrounded by water or mercury. Each such vessel was shaken at short intervals from day to day. Some of the vessels were kept exposed to diffuse light, and others were kept in the dark, and in all the precautions mentioned, no evidence of decomposition of the sulphide was obtained. It was found that the solution could be oxidized with tolerable rapidity at common temperatures by quickly and accurately measuring off known volumes, adding to each an excess of potassium permanganate acidified with nitric acid, and weighing the whole in a well-stoppered bottle until the change was complete. The sulphuric acid formed was determined as barium sulphate. Calculating from the quantities of sulphur thus found, the following results were obtained:—

Time of Contact with Water.	Average Temperature (nearly constant).	Solubility of CS ₂ .
30 days	12° to 13° C.	0.293 in 100 by weight
Do.	Do.	0.198 " "
Do.	15° to 16° "	0.188 " "
7 days	25° to 27° "	0.168 " "
17 days	30° to 33° "	0.146 " "
Do.	Do.	0.145 " "

It will be seen that the solubility diminishes with rise of temperature; but, so far as shown by these few determinations, this diminution does not occur at a rate equal to that at which the vapour-tension of CS₂ increases, as shown by the tables of Renault and Marx.

PURCHASE OF THE BRIDGNORTH GAS-WORKS BY THE TOWN COUNCIL.—On Saturday, the 16th inst., the Bridgnorth Gas Company agreed to part with the works to the Town Council, the terms of purchase being £10 per share. The amount to be paid by the Council will be £14,000.

SALE OF GAS AND WATER SHARES AT LEWES.—On Thursday, the 14th inst., Mr. H. E. T. Hickmott offered for sale by auction at Lewes a number of shares in local Gas and Water Companies. The first four lots consisted of £40 worth of original capital stock in the Lewes Gas Company, which sold for £72, £73, £74, and £74 respectively. Lots 5, 6, 7, and 8 were in the Lewes Water Company, the Lewes Gas Company, lot 5 selling for £30, lot 6 for £20, and lots 7 and 8 for £29 and £30 10s. respectively. Lots 9 and 10 were three original £10 shares in the Eastbourne Gas Company, which realized £55 and £54 10s. Lots 11, 12, 13, and 14 consisted of eight "B" shares of £10 each in the same Company, and were secured for £112, £109, £110, £110, £109, £110, £109, and £109 respectively. "B" shares of £10 each in the Company, and these were sold for £11, £10 10s., and £11 10s. respectively. There was a good attendance, and the bidding was very spirited.

in the iron trade of this district are not so good as they were at the commencement of the last quarter; a hopeful spirit, however, exists as to the future. Ironfounders, tube makers, and edge tool manufacturers are in the majority of cases steadily employed.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Very little alteration of a material nature can be quoted with regard to the finished iron trade throughout Yorkshire. Many of the larger and more important firms have a fair amount of work on hand, but contracts have had to be placed at very slight profits. The rail and merchant mills are in some instances very active, whilst the foundries devoted to the production of general castings have not much to do. Considerable interest is just now being attached to the use of coke-preparing machinery, appliances for washing and grinding the coal being freely adopted throughout the country. The Bessemer Steel Works are busy, there being several good foreign orders in hand. The sale of rails in particular is large. The blast furnaces, generally speaking, are kept going and are supplied with ore from North Lincolnshire, local ironstone being scarce.

The reports which come to hand from the West Yorkshire collieries are of a more encouraging nature. The pits in the Methley district are working five and six days per week, and in all probability an improved increase will follow, seeing that the men have agreed, in accordance with their sliding scale, to submit to a reduction of 2s. 6d. per cent. during the next four months. The steam coal trade to Hull and Goole is scarcely so active as it was, but some of the largest firms are sending a fair tonnage.

The local coal trade in South Yorkshire continues to improve. The improvement already noticed by the coalowners' declaration that they have been unable to get any material advance of prices, owing to the keen competition which they have to meet. Business with London has increased, owing in a great measure to the severity of the weather and the desire of merchants to lay in stocks for the winter months. The tonnage rates remain unchanged; but it is reported that the Great Northern Railway Company have come to the conclusion to disallow a certain drawback which they have hitherto given to Derbyshire coalowners using their lines, which will slightly benefit the South Yorkshire masters, inasmuch as the rate from Derbyshire will be a trifle improved. The demand for both Silketones and Bakers' (lump) coal for the Eastern district is not so active as it was, the opinion gains ground that if the miners were more sensible in their requests trade might somewhat improve.

The gas coal contracts are pretty freely supplied, and arrangements have been made at both the Wharfedale Silketone and Hoyland Silketone collieries for winter supplies. The coal trade in this district is, it is to be hoped, about business. Locomotive and manufactory coal are in moderate request, the former being for the most part supplied to large railway companies, and the latter to the Lancashire and Yorkshire cotton and woollen districts.

The gas coal trade is very active, and of considerable vitality, and in consequence of some of the pits being set down the demand for slack and smudge is on the increase. The whole of the pits belonging to Thorpe's Gawber Hall Collieries, Limited, are standing, but the entire range of ovens, numbering about 100, are kept going, fuel being obtained at various places in the district. The same may be also said with respect to the Church Lane Colliery, where some capital coke is being turned out.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The weather is extremely stormy in the North Sea. The wind is from the north-east, and down to Saturday it had been found impossible for sailing vessels to work down to the coal ports. The colliery offices were also closed, and the whole of the week, and the steamers were likewise scarce. Under these circumstances gas collieries have experienced some difficulty in getting their orders away, and a tendency of freights has been towards higher prices. Of course, when there are no ships to take freights, mere quotations are of little value, but the offers for handy tonnage show a rise of 1s. 6d. per ton. The demand for steam coal is, however, and when they are needed—as nearly all the boats engaged in the gas trade run under twelve or six months engagements—6d. to 9d. per ton are accepted on steam tonnage. The Durham gas collieries are very fully employed, and as the steamers arrive they are loaded with coal, and the third day of the week the main trade business goes on regularly enough. It is in the trade to the Channel and to the bye-ports wherein the delay arising from the scarcity of tonnage is most felt. The Baltic gas companies are completing their stocks of coals before the winter comes, and it threatens to be an early one in Russia and Germany. There has also been a demand for steam tonnage to load gas coals for the Mediterranean. More money has had to be paid in freight. The general coal trade of the North of England is somewhat stronger. The advance of 1s. per ton made upon house stores is maintained. There is more demand, too, for manufactory coal, but no advance of price. The demand for steam coals are in better request. Nut coals are more inquired after. There is little doing in coke, and prices are somewhat easier.

The demand for finished iron is less active, but it is still pretty strong. The Tyne and Wear ironfoundries are doing a large trade in the manufacture of castings, but the business is not active in the manufacture of water and gas pipes. The lead trade is all dead. Prices of Spanish, Rhinish, and English are lower, and the market is depressed. The timber trade in the north-eastern ports shows no improvement, and the demand for building timber is slack. Prices are rather stagnant.

REDUCTION IN THE PRICE OF GAS BY THE ROTHWELL GAS COMPANY.—At a recent meeting of the Directors of this company it was determined to reduce the price of gas from 5s. to 4s. 7d. per 1000 cubic feet, the reduction to date from the 1st inst.

THE NEW PURIFIERS AT THE MANCHESTER GAS WORKS.—Messrs. Newton Chambers, and Co., of Thorncliffe Iron-Works, near Sheffield, have just finished very fine pieces of work in a short space of time, for the Manchester Corporation, at their Rochdale Road Gas-Works. It consists of six purifiers 27 ft. 6 in. by 21 ft. 6 in. and 6 feet deep. The lutes were cast upon the side plates, and are 8 inches wide by 2 ft. 9 in. deep. All the connections are 24 inches in diameter, and are worked by twenty-nine rack and pinion slide-valves. The joints of the piping are planed. The covers are of wrought iron in the usual way, and the whole comprised 240 tons of cast iron, 65 tons of wrought iron, and 17,000 feet of wood sieves. The order was given on the 16th of July, upon condition that the work should be completed and handed over to the Corporation on the 9th of October. This was done, and a considerable quantity of work had been placed in the lutes on the 16th inst. The purifiers were set to 24 inches pressure, and four of them were at full work, with gas passing through, on the 16th inst. The Engineer (Mr. J. West) expressed himself as much pleased with the energy displayed by the Contractors, and with the quality of the work.

SALE OF SHARES IN, AND REDUCTION IN THE PRICE OF GAS BY THE RYDE GASLIGHT COMPANY.—Last Thursday, Messrs. E. Marvin and Sons sold by auction some 112 shares in the Ryde Gaslight Company—viz., 23 "original" shares, paying minimum dividends of 9 per cent. which realized £21 12s. 6d. per share; and 46 "ordinary" shares (7 per cent. dividend), which sold at prices from £16 15s. to £17 each. Notice has been given by the Directors of the Company that from and after the taking of the indices at Christmas, the price of gas supplied to the Ryde Gaslight Co. consumers will be reduced from 4s. 6d. to 4s. 3d. per 1000 feet.

SALE OF SHARES IN THE SHEFFIELD GAS AND WATER COMPANIES.—On Tuesday last a number of shares in the above undertakings were offered for sale in Sheffield. £400 worth of consolidated A stock in the Gas Company was withdrawn at £194 per cent.; £201 12s. consolidated class B stock was withdrawn at £191 per cent.; £180 consolidated class C stock, of the 30s. 6d. per cent. stock, at £192 per cent.; and £211 12s. 6d. per share. 18 class D preference shares in the Water Company were disposed of at £10 15s. per share; 18 class E preference shares were purchased at £4 14s. per share; and 18 class F preference shares sold at £1 13s. per share.

THE PRICE OF GAS AT PLYMOUTH.—In the JOURNAL of the 12th inst. it was stated that Plymouth Town Council, who have the following notice notified their intention of reducing the price of gas supplied to private consumers to 2s. 1d. per 1000 feet from Michaelmas. At the meeting of the Plymouth Town Council on Wednesday last, the Town Clerk read a communication from the Secretary of the Company, informing him that the price of gas supplied to the Plymouth Gas Company was to be reduced to £2 15s. 10d. per lamp per annum, the charge to which the Company are entitled under their contract being £2 17s. 2d. On the motion of Mr. Morrish, seconded by Mr. Pitts, a vote of thanks was accorded to the Company.

THE GAS SUPPLY OF BARNSELY.—At the meeting of the Barnsley Town Council on Tuesday last, the Mayor, in the chair, the following business was transacted:—The Officers of the General Purposes Committee, relative to the suggested purchase of the Barnsley Gas Company's works, appeared on the business paper.—"The Committee considered the expediency of purchasing the gas-works or otherwise, and, after considerable discussion, resolved—That, considering the probability that lighting by gas will shortly be suggested, and that the Corporation will be enabled to purchase the gas at a reduced price, the Committee resolved to request the Mayor to express themselves as not wishing to sell their property, the Committee recommend the Council not to take any steps for the purchase of the gas-works. The Committee consider that the gas-works are not sufficiently rated compared with other property in the town, and recommend that the Overseers be requested to reduce the gas rate." After some conversation relative to a requisition which had been forwarded to the Mayor on the above matter, it was decided to call a public meeting to consider the question of purchase, and the Council then went into committee on the subject.

THE BIRKDALE SEWERAGE WORKS.—On Friday, the 8th inst., the Birkdale Sewerage Works, which have been in course of construction since 1873, were formally opened by Mr. F. Hillé, inventor and patentee of the system that will be there employed for treating the sewage. The works are situated at the top of Aughton Road. The sewage enters through screening chambers, and from them into an underground reservoir, which will hold 500,000 gallons of sewage. From this reservoir the sewage is conducted into a pumping well, where it receives the necessary chemicals, and is lifted by two 10-horse power engines into two depositing tanks with a capacity of 370,000 gallons. From these, after precipitation has taken place, the effluent or purified sewage passes on to filter-beds 14 acres in extent, divided into five separate beds, which will be used in rotation, so as to ensure the most perfect purification of the sewage. Previous to the chemicals being sent into the pumping well they are mixed in the mixing pan, whence they are delivered into two mixing cylinders fitted with agitators, and thence pass into the well named. All the treated sewage, before being discharged into the brook, is passed over the aerating filter. The extent of the ground covered by the sewerage works approaches 5 acres.

THE WATER SUPPLY OF CONSETT.—Mr. W. M. Stock, Public Analyst for the county of Durham, has, at the request of the Consett Local Board, made an analysis of the water supplied by the Consett Water Company, Limited, and the result has been made public. After giving a tabulated analysis, Mr. Stock says the sample of water submitted to him was a soft and pure water, containing a small amount of mineral matter, and a small amount of organic matter, which was chiefly decaying vegetable tissue, along with which were many forms of living animal and vegetable microscopic organisms, the most objectionable of which were certain species of worms and some fungoid growths." Mr. Stock adds: "The conclusion I have arrived at from a careful analysis of the water is, that it is of a good quality, and is supplied with efficient filtration, it would form one of the finest water supplies in the kingdom; but that in its present condition of turbidity, having due regard to the cause of that turbidity—namely, the presence of decaying vegetable matter in suspension, along with fungoid growths and animal organisms of repulsive type—I do not consider it fit for human consumption. A copy of the above report has been sent to the Water Company, with an intimation that unless something be done forthwith to render the water pure, the assistance of the Local Government Board will be invoked."

THE PUBLIC LIGHTING OF TETTERHALL.—On Monday last week a public meeting was held at Tetterhall to consider the advisability of the lighting of the parish of Tetterhall by gas, which was undertaken by the ratemayers. Mr. H. H. Fowler, M.P., presided, and explained that the Road Trustees would cease to light the main Holyhead Road after the end of this month, and the meeting was called to ascertain whether or not the ratemayers would undertake the lighting of not only the main Holyhead Road, but also the parish roads. Mr. E. B. Fritchard stated that the ratemayers would have to elect not less than three nor more than twelve inspectors, who would have absolute power to say where lamps should be erected, and to enter into contracts for the supply of gas. The Act then adopted was that the ratemayers should pay the cost of the lamps, and the money must be collected only by rate levied on the full assessment of houses, buildings, and gardens, and upon one-third the assessment of land. He sketched the district which it would be best to include. There were at present in the parish 78 lamps. To light the area suggested, 124 lamps would be required, which would cost £2 18s. 3d. per lamp less, and would reduce the cost of the parish to £2 18s. 3d. per lamp. The ratemayers would have to light the district sketched out by Mr. Fritchard. The matter, will, however, be submitted to another public meeting, before any decision is arrived at.

THE WATER SUPPLY OF ALFRETON.—On Wednesday last, Mr. R. Morgan, C.E., one of the Inspectors of the Local Government Board, held an inquiry at Belper in reference to an application from the Belper Local Sanitary Authority for sanction to borrow £10,000 for works of water

supply for the contributory place of Alfreton. The Inspector having briefly stated the nature of the application, Mr. Fry explained that the first estimate of the cost of the works, as stated at the inquiry held at Belper in 1877, was put down at £24,498 12s. 5d. After that period some time elapsed before the sanction of the Local Government Board was given to the scheme. The prices both of iron and labour having advanced considerably, a second estimate was made, and amounted to £26,184 9s.; but the first amount only was applied for, leaving a deficiency for the cost of the works amounting to £1685 17s. 6d. The extra cost of land was caused by the site of the Somercoates reservoir being undermined, and another site was selected at a lower level, the underlying coal having to be purchased to secure the safety of the reservoir. The alteration of sewerage had made it necessary to have both high and low pressure services for one elevated district. The cost of the Riddings Water-Works, purchased by the Authority, was not included in the estimate. By the removal of the service reservoir to a lower level the Riddings supply would cost more, as larger pipes will be required to carry the same volume of water. The gas-mains and sewers had been laid without plans being made of their position, and had caused some trouble to avoid them when laying the water-pipes. Other evidence having been taken, the Inspector intimated that he would report to the Local Government Board on the matter.

THE LIVERPOOL CORPORATION (WYRWY) WATER SCHEME.—At a special meeting of the Wyrcwylle Council on Wednesday, the 13th inst., the Mayor (Alderman Hall) in the chair, Mr. Grindley moved: "That the Water Committee be requested to make a return of the entire costs in connection with the Wyrcwylle water scheme, from the outset to the passing of the Act, including all parliamentary and other expenses of provision of the Wyrcwylle Water Supply Bill, and to secondly, to second the motion, and in doing so said an important matter had been started, since the last meeting of the Council—he alluded to the appointment of a Water Engineer—and he should have been more pleased if they could have had some idea given them as to the future liabilities of the Water Corporation, as they had in the past. The motion was adopted. At the meeting of the Water Committee on Monday last week, a vote of thanks was passed to the Chairman (Mr. Wilson) for his services in connection with the Corporation water scheme, and that gentleman, in acknowledging the vote, said it was a matter for congratulation that the Wyrcwylle scheme was the first of the kind in which the Corporation had plans for having been prepared by their own staff, showing that they had received parliamentary sanction. He anticipated from the constant service of water an ultimate saving of £50,000 per annum, which it was estimated would pay the interest on the money laid out upon the scheme without exceeding the interest on the Corporation's other loans. He said, a magnificent estate, with an overflowing revenue, a good staff, and a water scheme which, with energy and determination, should five years hence relieve Liverpool from any fear of a water famine for the next century.

THE PUBLIC LIGHTING OF WINCHESTER.—The "high and mighty" notions of the Winchester Town Council, in respect to the employment of the electric light for illuminating the streets of the borough have received a rude rebuff, if one may judge from the remarks of the Mayor (Captain J. C. Moore), at a recent banquet to the representatives of the principal institutions of the city, corporate officers, &c. Captain Moore, replying to the toast of "The Corporation," is reported to have said that he knew of no particular work on which it was necessary to speak, except one that was mooted a few months back, for the purpose of electrifying the city from semi-darkness by the adoption of the brilliant electric light. Having heard nothing respecting it lately, the citizens probably now regarded the subject as only a nine days wonder. But this was not so. He and others entertained the opinion that it was perfectly adaptable to the city, and that he was sanguine enough to say that, had not two obstacles been interposed, it would have been carried out in Winchester. A few of the members of the Corporation deputed to report on the feasibility of lighting the city by electricity had visited London, and the result was that the deputations were convinced of the practicability of the light, and the desirability of introducing it into Winchester. They accordingly made to the Local Government Board for sanction to borrow the necessary money on the security of the city rates. They, however, declined to grant their sanction, on the ground that the practicability of the system of lighting the public streets by electricity had not been sufficiently tested. The Town Council then applied to the patentees to advance the necessary amount, but they declined, having already so many pecuniary demands upon them. The consequence was that at present the idea of adopting the new light was in abeyance.

PRESENTATION OF A TESTIMONIAL TO MR. LEVI MONK, OF LANARK.—On Thursday, the 14th inst., about 50 friends and acquaintances of Mr. Levi Monk met at the Clydesdale Hotel, Glasgow, for the purpose of presenting him with a testimonial on his leaving to fill an appointment at Colombo, in Ceylon. Provost Lamb occupied the chair, and Mr. J. Annan, solicitor, was croupier. After doing honour to the loyal toasts, the Chairman said it was a most pleasant duty he had to perform that evening—the presentation of a testimonial to their friend Mr. Monk. Mr. Monk had been twenty years among them, and during that time he had not only gained public friendship as well as that of the Gas Company, but he had, with the support of that Company, greatly improved the works, which enabled them to supply the city at a low price, and under his management the affairs of the Company had prospered beyond all expectations. Mr. Monk that he had the best wishes of his many friends in Lanark. He then, in the name of the subscribers, presented him with a handsome gold watch (the inner case of which bore an appropriate inscription) and a smart guard, and a lady's gold chain for Mrs. Monk. A toast of "Long Life to the property of the Gas Company" was then proposed, enthusiastically received. Mr. Monk, in acknowledging the presentation, thanked the donors both for Mrs. Monk and himself, assuring them that he could not express his feelings and sentiments at that time. He was glad his efforts to improve the affairs of the Gas Company and the gas supply to the public had met so much approval. He had simply done his duty, and he was proud to think that the prospects of the Company were so much brighter than when he took their business in hand. A gas manager had many to please and some opposing interests. It had always been his duty to do his best, and to live in peace and harmony with all men, and the event of the evening showed that he had been so far successful. He valued the gifts most highly, but there was something evinced in the meeting that he valued far higher, and that was the goodwill of honest men. If he and Mrs. Monk had known there had been so many warm friends in town and country, he would not have been so tempted to leave it. Mr. Monk sat down amidst great cheering. Among the other toasts were "The Lanark Gas Company." Altogether the evening was spent most enjoyably.

IMPROVED STREET LIGHTING AT BIRMINGHAM.—The Birmingham Daily Post says: "For a considerable time past mention has from time to time been made at the meetings of the Birmingham Town Council of the experiments conducted by the Gas Committee with a view to the adoption of some system of gas lighting which will compete with the electric light for the purpose of illuminating large public spaces. The public will shortly have an opportunity of judging of the result achieved. The Gas

Committee have made careful trial at the Windsor Street works of all the improved forms of gas lamps which have been tried in London and Paris, with the modifications suggested by their own Engineer and the various lamp makers. The aim has been to ascertain two points—the most effective burner relatively to the quantity of gas consumed, and the form of lantern which best diffuses the light afforded. Upon the former point, the Committee have decided in favour of a triple cluster of Bunsen's baffling burners; and upon the latter, the experiments have conclusively demonstrated the superiority of a globular form of lantern over any of the angular patterns. It is proposed, and the work is now in progress, to place upon the refuge in front of the Council House a standard bearing five globes, and the framings of the Council House five standards, with three globes each, while 34 posts with single lanterns will be distributed at intervals of 50 or 60 feet along the footpaths of Paradise Street, the end of New Street, and the thoroughfares round the Town Hall. A standard with a group of five globes will also be placed at the junction of Paradise Street, Suffolk Street, and High Row. Referring to the details of the illuminating apparatus, it should be stated that the burners are fitted on to a special form of tap, designed by Mr. Hunt, the Engineer at Windsor Street works, by whom the trials have been principally conducted. Upon each tap four burners are fixed, but only three are intended to be lighted, when the greatest illumination is needed. The centre one is to serve two purposes—in the first it will afford a 'flash light,' or small jet to burn all day, and from which the other burners are lighted, and in the second place it will burn at full height by itself during the later hours of the night, when the others are turned out. Each burner consumes 10 feet of gas per hour, and measuring 4 inches in height and 5½ inches in width, and having an illuminating power equal to 30 sperm candles. The three jets in each lantern, though close together, burn separately without blending their flames as in duplex and triplex jets, and therefore the total illuminating power of each globe is equal to 90 candles, as the result of burning 30 feet of gas per hour. It will thus be easily imagined that a group of five such globes will afford a very intense blaze of light. With regard to the standards and globes, there can be no dispute that they are more pleasing to the eye than the majority of patterns of street-lamps. Each globe has a diameter of 27 inches, and the rim is as thin as possible, so as not to obstruct the view. The shade of the upper part is lined with opal plates, the reflection from which will dissipate to some extent the shadow of the post, and each globe has a special construction of chimney to carry off the heat, and prevent down-draught. The standards, which are of tasteful design, are supplied by Messrs. Hart, Son, and Peard, of Birmingham. The work of erecting the lamps will finished in time to allow them to be lighted on the 29th inst. (to-night), when it is anticipated that they will have the effect of rendering the vicinity of the Town Hall more brightly illuminated than the open spaces in Paris at which the electric light is used, and at a more moderate cost."

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 4096.—DICK, G. A., Cannon Street, London, "Improvements in the construction of furnaces for the manufacture of coke, distillation of gas, and for other similar purposes." Oct. 13, 1880.
 4100.—WOODWARD, J., Manchester, "Improvements in valves for gas and other fluids." Oct. 9, 1880.
 4156.—JONES, F., Birmingham, "Improvements in or applicable to gas-burners and in globe-holders for which such globe-holders being also applicable to other burners." Oct. 13, 1880.
 4159.—KESSELER, C., Berlin, "Improvements in the 'Simons' steam gas motor with burning flame in the cylinder." A communication. Oct. 13, 1880.
 4177.—WATTS, P. J., Balham, Surrey, "Improvements in apparatus for extracting tar and other impurities from gases or vapours." Oct. 13, 1880.
 4196.—LOVE, W., Glasgow, "Improvements in apparatus for heating and ventilating by means of oil or gas, and in part applicable to lighting apparatus." Oct. 15, 1880.
 4243.—WATTS, W. B., Southampton Buildings, London, "An improved apparatus for regulating or controlling the flow of gas or other fluids." A communication. Oct. 18, 1880.
 4254.—BENSON, W. A. S., Kensington, London, "Improvements in apparatus for the distribution of artificial light." Oct. 19, 1880.
 4260.—ROBINSON, H., Hinchley, "Improvements in gas motor engines." Oct. 19, 1880.
 4270.—BZECHLY, C. G., Hilgast, Norfolk, "Improvements in gas motor engines." Oct. 20, 1880.
 4278.—BULL, H. C., Brooklyn, U.S.A., "Improvements in and relating to the manufacture of coke and residuary products, and ovens and apparatus appertaining thereto, parts of such apparatus being applicable otherwise." Oct. 20, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

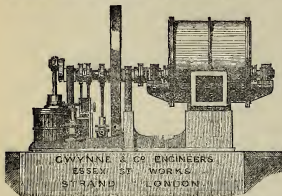
- 1512.—HILLS, W. A., Saltney, Flint, "The utilization of alkali waste, gas lime, or other forms of flint, for the production of tri-alcide and di-alcide phosphates." April 13, 1880.
 1539.—LIDDELL, E., Preston, Lancs., "Improvements in apparatus for lighting, and heating by gas, applicable in part for igniting fuel to produce coal or other fires." April 15, 1880.
 1567.—ENGEL, F. H. F., Hamburg, Germany, "Improvements in automatic apparatus for lighting, regulating, and extinguishing gas-burners." A communication. April 16, 1880.
 1592.—HARTLEY, F. W., Wotton Road, London, "Improvements in gas cooking apparatus." April 22, 1880.
 1592.—WILLIAMS, H., and MALAM, J., Southport, Lancs., "Improvements in and relating to atmospheric air and gas motor engines." April 24, 1880.
 1593.—FARLANE, J., Glasgow, "A new or improved construction of water meter, also applicable as a water-meter." Partly a communication. May 1, 1880.
 1593.—PRESTON, F. P., PRESTIGE, J. T., and PRESTON, E. J., Deptford, London, "Improvements in apparatus for regulating and controlling the flow of water and other liquids, and preventing waste of same." May 11, 1880.

PATENTS WHICH HAVE BECOME VOID

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 AFTER THE EXPIRATION OF THE THIRD YEAR.
 3618.—LONGSHAW, J., "Improvements in the method of and apparatus for lighting streets and other gas-lights." Sept. 27, 1877.
 3708.—LITTLE, O., "Improvements in gas governors or regulators." Oct. 5, 1877.
 3817.—HAMMOND, J., "Improvements in purifying coal gas." Oct. 15, 1877.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



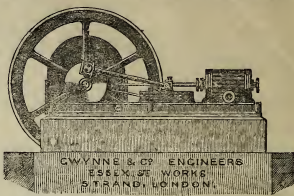
EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.,** Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.



52,500 EXHAUSTER, with Horizontal Engine combined.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,

WITH
Wrought-Iron Spindles and
ENGINES COMBINED.

SOLE MAKERS,
GEORGE WALLER & CO.

MAKERS OF ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[SEE ALSO ADVERTISEMENT, PAGE 670.]

Phoenix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED. Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas," on Burners, &c. Copies, by post, Threepence, direct from the Author, **MASTERS OFFICE, 48002, N.E.C., Gas-Works, STRIDHAM.**

WANTED. by the Advertiser, a Young Man, aged 27, an Engagement in a Gas Company's Office, Assistant Engineer, or Clerk of Works, &c., has had every experience in a Gas-Works. First-class testimonials and references.
Address No. 695, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED. by a Young Man (married), a Situation in a Gas-Works. Is the son of a Manager, and is a good Main and Service Layer. Can do any Fittings in the Retort-House; also can Fix and Read Indexes of Meters, and has had experience both at Lath and Vice. Very steady.
Apply to the MANAGER, Gas-Works, Crayford, KENT.

WANTED.—The Advertiser, a Young Man, aged 30, married, is open for an Engagement as MANAGER and SECRETARY of a medium-sized Gas Works, or SUB-MANAGER of a large Works. Has a thorough knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Gas-Works for 16 years. Highest testimonials and references.
Address No. 678, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER, aged 21, is desirous of an Engagement on Gas-Works. Can Read and Fix Meters; has had good experience of the Lath, and is willing to be generally useful.
Address R. C., care of Messrs. Willey and Co, Gas Engineers, E.C.

MANAGER and Gas-Fitter in a small Works wants a Situation. Seven years reference. Address E. B., Barnham, SOMERSET.

WANTED. by the Rugby Gaslight and Coke Company, Limited, an Active, Steady Man, as FOREMAN for the Works. He will have to Lay Mains and Service, take Indexes of Meters, and attend to complaints. Wages 28s. per week, with house, coal, and gas.
P. SIMPSON.

MANCHESTER CORPORATION GAS-WORKS.

THE Gas Committee are prepared to receive APPLICATIONS for the Appointment of an Experienced MANAGER at their Rochdale Road Station, at the salary of £300 per annum.

Applicants must have a thorough practical knowledge of the Manufacture and Purification of Gas upon the most approved modern system, and be fully acquainted with the Construction and Working of the various Apparatus employed therein, and must have had experience in the control of large numbers of men.

The Manager will be required to devote the whole of his time to the duties of the position.
Applications, stating age and experience and enclosing testimonials, must be sent in not later than Twelve o'clock noon, on the 30th of October, addressed to the Chairman of the Gas Committee, Town Hall, Manchester, and enclosed "Application for Appointment as Station Manager." Convancing will be dispensed with.

By order,
JOS. HIRSON, Town Clerk.
Town Hall, Manchester, Oct. 13, 1880.

DESIGNS and Specifications are invited for a GAS-HOLDER-TANK, 70 ft. diam. tier and 18 ft. deep, with TELESCOPIC HOLDER for the same.
Full particulars may be obtained on application to EDWIN A. WILSON, Secretary, Brecon Gas Company.

WANTED. by an established Foreign (European) Gas Company, a RESIDENT ENGINEER, who must be experienced in the Management of Gas-Works, and well versed in the details of the Manufacture and Distribution of Gas and Treatment of Residual Products according to the most recent and approved methods. Salary and commission from £350 to £500 per annum, according to qualifications.
Applications, with testimonials, to be addressed to ENGINEER, care of Messrs. WATERLOW AND SONS, 49, Parliament Street, WESTMINSTER, S.W., on or before Nov. 18.

WANTED. to Lease Gas-Works.
Highest References.
Apply, by letter, to No. 680, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE.—A Second-hand Station-Meter to pass 4000 cubic feet of gas per hour, in good repair, with Valves, Bends, and Connections complete. Offers to be addressed to the MANAGER, Alton Gas and Coke Company, Alton, HANTS.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the West Kent Gas Company invite TENDERS for all the surplus TAR at their Works, for One or Two years. As to Erith, to be pumped into Contractor's barges at the Company's Wharf upon the Thames. As to Crayford, to be filled into Contractor's casks or tank-vans at the Works. Quantity at each Works, 20,000 gallons more or less.
Tenders to be delivered sealed, and endorsed "Tender for Tar," on or before Monday, the 1st of November, at the Offices of the Company, No. 237, Southwark Bridge Road, London, S.E.
The Directors do not bind themselves to accept any tender.

Oct. 18, 1880.

ROBT. P. KEYS, Secretary.

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TO CORRESPONDENTS.

H. N. H.—Next week, too late for to-day.

A. PERMANENT SUBSCRIBER (Vienna).—See last week's issue; also again to-day. Thanks, however, for the hint.

W. K.—The question will possibly soon come forward in a more important form. We will not forget your remarks at the proper time.

RECORD.—"Stationary Engine Driving." A Practical Manual for Engineers in charge of Stationary Engines. By Michael Reynolds, M.S.E. London, Crosby Lockwood and Co., 1881.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 2, 1880.

Circular to Gas Companies.

THE speeches of the President of the Board of Trade at Birmingham last week, in connection with the inauguration of the Chamberlain Memorial, have naturally given rise to some comment in the daily press: The utterances of a Cabinet Minister necessarily attract attention at all times, in general as much, perhaps, from the official position of the speaker, as from any personal eminence he may otherwise possess. Sometimes, however, a Minister of the Crown may be found to possess claims to public notice not only because of his personal and official standing, but also from the fact of his being the representative of some particular class; and this is peculiarly the case of the Right Hon. Joseph Chamberlain. In fact, Mr. Chamberlain may be said to represent at least two separate sections of public men—the one on account of his well-known political complexion; and the other, with which we are more concerned, in consequence of his being the most notable example of the truth that Imperial distinction may, in the present day, follow upon thorough work in the apparently restricted field of local government.

Mr. J. Chamberlain's career in connection with the administration of the affairs of Birmingham attracted much general interest from the first development of his particular method of handling municipal matters, and the importance naturally belonging to the great Midland town was to some considerable extent enhanced, in the estimation of those interested in

watching the growth and consolidation of our youthful scheme of local self-government, by the prevailing impression that an administrator, if not exactly "heaven-sent," at least of uncommon force of character, was devoting himself to local affairs with the ardour commonly associated with more pretentious political objects. To any one accustomed to mark the ceaseless squabbles and unfruitful rivalries which occupy the time and waste the energies of many representative bodies, the practical dictatorship popularly supposed to have been exercised in Birmingham by Mr. Joseph Chamberlain, up to his voluntary withdrawal from active work in the Corporation, must have appeared no mean testimony to the completeness with which he succeeded in identifying himself with the opinions and desires of his colleagues, or in bringing theirs up to the level of his own. If his success had lain in the former procedure, it would have been impossible for him to have carried out the many projects which are locally identified with his name, and in the execution of which his own individuality became so invariably conspicuous. Hence we are led to believe that he possesses as much creative ingenuity as administrative ability, and that his fellow-townsmen really followed his lead.

That the lever with which Mr. Chamberlain worked in the Birmingham Town Council was the practically handy though theoretically cumbersome one of party politics, is not of much real moment, except as supplying one of the reasons why he should have been sought out for that reward of high office to which the same influences open the way. But in the councils of the nation, as in his accustomed local sphere, it is not to be supposed that the energetic reformer will regard politics as anything more than the means to achieve definite ends. The ability to lead the opinion of his colleagues will serve the Cabinet Minister in as good stead as it served the Mayor and Alderman, and the mental bias which impelled the latter to strike out new lines of progress, in the conduct of the business which lay nearest to his hand, will not desert him in consequence of his brilliant transformation. What will these lines now be? It is not to be expected that in the Imperial Cabinet any one man can, at will, so control the course of events as to invest the annals of an Administration with the character of a record of the work of his own department. It was a very sore point indeed with the present holders of office, during the time when the late Government were in power, that domestic legislation was shunted in favour of foreign policy. It may be a disappointment to the President of the Board of Trade to experience the necessity of remaining somewhat in the background, as far as his own office is concerned, while he has to advise with his more occupied brother Ministers on questions of over-awing Turks or curbing Mr. Parnell. It is possible, though it is not very probable, that the occasion may not present itself, during Mr. Chamberlain's tenure of office, for him to startle or gratify the public by the inauguration of any new departure in those branches of his departmental occupation wherein his province marches with the domain of the Local Government Board. But if he does find work suited to his mind, in conjunction with one or more of his colleagues, in re-arranging say the organization of the Metropolis, or enlarging and amending the powers possessed by local authorities, we know to what his whole past training has tended to lead him, and in his latest utterances we yet find him asserting that the acquisition by public authorities of gas and water undertakings still possesses with him an importance even exceeding some of the recent incidents of Imperial foreign policy.

We need not discuss the precise state of Mr. Chamberlain's convictions with respect to the latter description of his official responsibilities; it is enough for us to note that the President of the Board of Trade is now, as ever, an expressed enemy to Gas and Water Companies, as such, although he decidedly likes their property. If he could have his own way in the matter, he would probably provide every possible facility for the "happy despatch" of all Companies trading in the two necessities of town life; but his opportunities in this direction may fall short of his aspirations. Meanwhile, it is as well to know what is the bent of the official mind, and this Mr. Chamberlain very frankly opens to us. It is, however, unfortunate that the practice of the Birmingham Gas Department does not hold out much hope that the present Chief of the Board of Trade will in all cases resolutely defend the rights of gas consumers, by setting his face against Corporations dealing in gas at a profit. The Birmingham practice in this respect is the great blot on the otherwise admirable management of the gas undertaking, and is not the least operative cause of those costly arbitrations and severances of districts formerly supplied by the Staffordshire

Company, in which Mr. Chamberlain's name is not held in such high veneration as it appears to be within the limits of the borough. For ourselves, we confess that our admiration of the works of improvement carried out by the Town Council during the last few years would be infinitely greater, and our estimate of the public spirit of the authorities and public of Birmingham would be much higher, could we be assured that they were the spontaneous outcome of a far-seeing policy, instead of being in a great measure supported by the involuntary contributions of a portion only of the population. And we trust that in any proposals which may emanate from Mr. Chamberlain for dealing with Gas and Water Companies in the way which most pleases him, he may look less at possible "plunder" attending their management, and more at the principles of equitable taxation to which he and his school of politicians are such staunch adherents.

Judgment was given, on the 27th ult., by Mr. W. H. Higgin, Q.C., Chairman of the Salford Hundred Court of Quarter Sessions, in the matter of the petition by two gas consumers for a reduction in the price of the gas supplied by the Salford Gas Company. The case has been already referred to in the JOURNAL, and it need only be repeated that the action was taken under certain provisions of the Gas-Works Clauses Act, 1847, which authorize Magistrates, sitting in Quarter Sessions, to appoint, upon the petition of two gas ratepayers, an Accountant to examine a Gas Company's books, and if the profits made by the Company have exceeded the prescribed limits, to order a fair reduction to be made in the price of gas. In the present case the Court found for the petitioners, there being practically no defence as to the division of excessive profits, the officers of the Company and of the Court differing merely as to the amount that had been so divided, which, of course, did not affect the main principle involved. A strong point was, however, raised on behalf of the Company, that as the phraseology of section 35 of the Act presupposes the formation of a reserve-fund with the excess profits, and the directions to the Court as to procedure in cases of this kind apply specifically to such a fund, the fact that the Company had neglected to comply with section 31, and had failed to establish any reserve-fund at all, must be held to have placed them beyond the jurisdiction of the Court. This contention was disposed of by the Chairman in delivering judgment, though not without acknowledgment of its plausibility, by making the bold assumption that as the Company had had enough money at one time to constitute such a fund, they must therefore be held to have done so, in spite of the evidence to the effect that they had otherwise disposed of the money. That is to say, that any surplus moneys in hand necessarily partake of the nature of a reserve-fund, although not actually set aside or invested under this title. Hence it was ordered that the price of the Company's gas should be reduced to 3s. 2d. from 3s. 6d. per thousand cubic feet. The Court made an order for payment by the Company of the costs of the petitioners, and held out every inducement to them to appeal from the decision, with the view, openly expressed by the Chairman, not only of strengthening the reading by the Court of their powers of jurisdiction under the Act, but also of testing the power of the Superior Court of ordering the Company to refund the wrongfully divided profits. This course the Company did not appear willing to take, and consequently, although it would be of general interest to have the loose wording of the Act thoroughly gone into, in connection with a case which forms a precedent of such importance, this disagreeable matter will probably end where it is, with advantage to the parties immediately concerned.

Referring to our comments in last week's JOURNAL on the British Gaslight Company's latest difficulty with the Norwich Town Council, we find it will, perhaps, be advisable to correct a false impression which may easily be formed from the concluding sentences of our remarks respecting the practical issue of the debate in the Council. The report of the Special Committee on the relations of the Corporation with the Company states, with respect to the power of auditing the Company's accounts possessed by the Corporation, that "no appointment or re-appointment [to the office of Auditor] has been made since 1858." If this is not calculated to convey the impression that no audit has been made during the period, we do not know the meaning of the English language. As a matter of fact, however, it now appears that Mr. R. J. Richardson was appointed by the Corporation in 1858 to audit the accounts of the British Gaslight Company in connection with their Norwich station, and he continued to dis-

charge his duties in that office until the early part of the present year. Every statement of accounts furnished by the Company to the Corporation for twenty years was signed by this gentleman, and no complaints were made as to their accuracy until recently, after he had ceased to occupy that position. Now a fresh appointment is to be made, and it is difficult to see that such a tremendous indictment was necessary to sustain such a very simple proceeding. It is quite preposterous to imagine that the Company will be in the least affected by the appointment of any Auditor; but it is not so certain that the reports of a professional Accountant, dealing with facts instead of suppositions, will bear out the statements of the local financial geniuses, and in that case the unfortunate official will probably come in for his share of the misrepresentation and abuse which have been of late so freely indulged in respecting the Company.

A letter by Mr. W. H. Preece, in *The Times* of the 28th ult., on the subject of electricity in collieries, comes very opportunely after our remarks in last week's JOURNAL on the danger of the present forms of electric lamps. Mr. Preece is President of the Society of Telegraphic Engineers, and can, therefore, scarcely be considered as prejudiced against the extended use of electricity, yet we find him stating that "it cannot be too strongly insisted that the absolute safety of the electric light is a popular delusion." In the communication in question Mr. Preece chiefly addresses himself to refute the arguments of certain persons, whose enthusiasm is equal only to their ignorance, and who have lately been distressingly persistent in advocating the use of the electric light in collieries. Upon these enthusiasts Mr. Preece throws enough cold water to extinguish utterly their feeble and uncertain glimmer of suggestion. His exposure of the risks incurred in the use of electric lamps is rather startling, yet justifiably so, in the light afforded by recent experience. He points out the danger of igniting the gas in mines by the intense heat of the electric arc, and also the liability to loss of life and to fire by imperfections in the coating of the conducting wires. According to this authority, the difficulty of keeping ordinary telegraphic currents in their proper courses is very great, and any faults in the insulation of the wires cause loss of electricity to earth, attended with heat, and occasionally fire. He states that ordinary telegraphic offices have, to his knowledge, been set on fire in this way, in New York and Boston, and expresses his belief that the recent fire at the Manchester Telegraph Office may have arisen from such a cause. If this be so, how much greater must be the danger of fire from currents many thousand times more powerful than any used in telegraphy, such as are those necessary for the development of the electric light? Mr. Preece's letter is eminently calculated to disturb the equanimity of the custodians of the library of the British Museum, who have lately adopted the Siemens light, after having consistently denied admission to gas as being too dangerous. It is to be hoped that they will not have cause to regret their action, for the reason declared by Mr. Preece to exist in such force as to entirely preclude the use of any known form of electric light in mines where inflammable gas is found.

The Gas Department of the Birmingham Corporation has issued a carefully compiled illustrated catalogue of apparatus for the use of gas for cooking, heating, and trade purposes. The illustrations given are from designs furnished by manufacturers of the different articles, whose fixed prices are in all cases stated, as the department does not manufacture any of the goods, but undertakes their supply and fitting up if required, and keeps a show-room where they may be inspected by consumers, and any information respecting cost and manner of using them obtained. The department does not attempt to do a pushing trade to the detriment of the wholesale or retail traders, but very wisely advises intending users of these articles as to the conditions under which they may be expected to give satisfaction. The utterances of the department, respecting its own responsibility in the matter of affording sufficient day pressure for the successful working of gas apparatus, are sanguine as to its capability of pleasing everybody; though somewhat dubious on the point of the benefits it expects to derive therefrom in the immediate future, presumably on account of the leakage question. It may be hoped that the response to be obtained by the department to the question it has now put in a practical shape, as to whether the public will use gas by day if they can get it, will be such as to warrant its present action.

The useful series of lectures in connection with the Glasgow Exhibition of Artificial Lighting Apparatus has now been

brought to a close, and the exhibition itself has also run its course, after an existence, as we hope, of utility to the public and satisfaction to its projectors. Mr. A. Vernon Harcourt, M.A., F.R.S., who commenced the series of lectures by dealing in a popular manner with the question of domestic gas lighting, must be credited with making his subject clear to the most unpractical of his hearers, from the initial operation of the carbonization of coal, to the ignition of the gas therefrom at the consumer's burner. That "boss" puzzle to most gas consumers, the meter, was very happily explained by the lecturer, who in this as in his other detailed descriptions of gas apparatus, illustrated his remarks with examples drawn from the stands of various exhibitors.

Mr. Groville Williams, F.R.S., delivered the second lecture, on the subject of the coal-tar colours, of which there were several good collections in the exhibition. This lecture was of similar nature to that delivered by the same gentleman before the last meeting of the British Association of Gas Managers in June.

Dr. Stevenson Macadam delivered the fourth lecture, on the "Illumination of Lighthouses," in the course of which he did not express unbounded belief in the advantage of gas for this purpose, when it has to be specially made, chiefly, as it appears, on the grounds of uncertainty, and the trying nature of the work connected with the lamps. As against this view, we may be permitted to refer our readers to the report on the lighting by gas of one of the most important lighthouses in Ireland, part of which appeared in our last week's issue. This report has perhaps not been perused by Dr. Macadam, but in case he has done so, and still disagrees with the conclusions favoured by the Commissioners of Irish Lights, his reasons for so doing would be interesting, if expressed in detail. On the matter of labour in connection with the lamps, we feel sure Dr. Macadam is in error in believing that gas would be as troublesome to the lighthouse keepers as the dirty oil lamps, and we fail to see how the production of gas by means of small special plant could be considered at all uncertain, while the labour of making and delivering the gas to the burners, apparently deemed heavy by the lecturer, is of a very ordinary character indeed.

Mr. Fletcher's lecture on "Heating by Gas" was a strenuous plea for the convenience and economy of gas for purposes other than lighting, especially when used in Mr. Fletcher's burners and apparatus.

The concluding lecture, on "Lighting and the Transmission of Power by Electricity," by Mr. J. N. Shoolbred, was not remarkable for much original information.

Mr. Hunt's experiments on the relative diffusive power of globular and square lanterns, a brief account of which was given to the members of the Midland Association of Gas Managers at their last meeting, are another step in the investigation of the best means of street lighting to which Mr. Hunt has addressed himself. As a consequence of these experiments, Mr. Hunt states the advantage to be invariably with the round form, partly on account of the better regulation of the air supply, and also because of the directness with which the rays of light pass through the glass in lanterns of this shape. The appearance of the circular lanterns is, of course, much more ornamental, and the fact that they also give more light than the inelegant square lamps must be held to compensate, in a great measure, for their higher cost. As we shall probably before long have something more to say about Mr. Hunt's endeavours to improve the lighting of streets and open spaces by gas, we shall abstain for the present from more particular comment on his experiments.

The well-worn subject of leakage was threshed over again at the last meeting of the West of Scotland Association of Gas Managers, by Mr. Niven, of Dunoon, and the speakers who joined in the discussion on his paper. Mr. Niven does not believe in the permeability of iron pipes to gas, at least to any appreciable extent. In this he was not supported by the majority of the members present, although several curious facts respecting the wear and tear of mains, for and against his views, were brought forward. That some osmotic action goes on must, we think, be taken as an established fact, but there is little indisputable evidence as to its quantity under ordinary conditions. The question is complicated ordinarily by the leakage due to joints and valves, and it would be an interesting, though perhaps tedious labour to determine the facts of the phenomenon in some reliable manner.

Mr. R. Mitchell's paper, read at the same meeting, on the "Valuation of Gas-Works for Rating," shows the uncertainty which still prevails in many quarters as to the principle

upon which the rateable value of such property should be ascertained. The sense of the paper is not so clear as it might be in the matter of the true basis upon which valuation should proceed, in comparison with the practice complained of by the author; but it at least shows the necessity for the universal acceptance of a definite rule. The pending arbitration in the Shopp's valuation case, to which we alluded last week, will serve to fix the method of procedure in accordance with the most enlightened modern practice, and will therefore be awaited with considerable interest by those concerned in matters of rating and the valuation of gas-works in all parts of the kingdom.

A case of personal interest to Secretaries and Engineers of Gas Companies recently arose in the course of the revision of the list of parliamentary voters for a suburban district. The name of the Secretary of a Gas Company was objected to "on account of his occupying Company's premises and not "paying rental." The claim was allowed by the Revising Barrister, on the ground that it was in no way essential to the due performance of his duties that the Secretary should reside on the Company's premises; and his residence being quite distinct from the offices of the Company, he had a right to a vote. The Revising Barrister, in giving the reasons for his judgment, stated as his opinion that if the Secretary had united with his duties those of Engineer to the Company, it would have been necessary that he should reside on the premises, and therefore he could not, presumably, possess a vote by virtue of such residence. But with all respect due to the authority in question, it is not by any means true that residence on the premises is essential to the due performance of the duties of Engineer to a Gas Company, many instances going to show the contrary. The dicta of Revising Barristers do not always agree in different revisions, but according to the reasons for the present decision, no Gas Manager or Secretary living on the premises of his employers can be rightly deprived of his vote.

A Limited Liability Company, has been formed for the purpose of working up the rich material known to the chemical trade as "sulphur-oxide," in reality the spent oxide of iron used in gas purification, by a new patented process, which is said to take out the sulphur in a form as pure as the roll-brimstone of commerce, and to return the oxide as fit for use in the purifiers as when revived in the ordinary way. The quantity of the material annually turned out of the Metropolitan gas-works, to say nothing of the larger provincial establishments, is so enormous, and it is so rich in sulphur, that any process treating it in an economical manner, and without destruction of the oxide base of the compound, should soon establish itself as a valuable industry, and would also help to illustrate the extraordinary modern development of the secondary or residual products of the manufacture of coal gas. We shall probably find occasion to describe the process in detail on an early date.

Water and Sanitary Notes.

THOSE parties who wish to have a share in the extraordinary prosperity of the New River Company will have an opportunity to-morrow, on the occasion of the sale by auction of sundry shares in that "grand and unique trading corporation," as we find it designated. A capitalist of moderate pretensions may purchase a fractional part of a share in the Adventurers Moieties, or, if he prefers it, a fraction of a share in the King's Moieties in this undertaking. There are also thirty new shares of £100 each to be offered for sale. The Company are described as deriving "from land and water" an annually increasing income, amounting last year to £424,097. The prospectus of the sale is worth studying, having all the appearance of being sufficiently inspired to render its utterances, if somewhat extravagant, at least suggestive. Thus we read: "Now that the purchase of the "Water Companies has been relegated to inquiry, no action "will be taken for years." It is also predicted that the income of the New River Company will inevitably be so advanced, that, whatever basis of calculation may be adopted, when the time for the purchase actually arrives "a much "larger sum will have to be paid to the Proprietors than "would have been the case under the defunct scheme "of the late Government." The prospect of any competing scheme is described as "simply visionary," and it is suggested that the New River Company could, from their own wells in the chalk, and with but comparatively small outlay, meet "the dietetic requirements" of the whole

of London. This, of course, would necessitate a dual supply, which, we take it, is quite as visionary as competition. That the price proposed to be paid under the late Government Bill for taking over the New River undertaking was not excessive, is shown by a quotation from the evidence of the late Mr. E. J. Smith, who stated that the bargain was based on the market price of 1879, with an addition of ten per cent. "I reduced their terms as much as I could," said Mr. Smith, "and as these were under what I should have to give with compulsion, I agreed." Altogether, the New River property has "an illimitable future." Of its marvellous growth in the past there can be no doubt, its income having doubled in the last fifteen years. The value of the land belonging to the Company is a speciality not to be lost sight of. The estates in London and in the counties of Middlesex and Hertford extend over hundreds of acres. The Myddelton Square Estate, consisting of over fifty acres covered with buildings, in the heart of London, is now let at ground-rents; but in about twenty-seven years time the leases will begin to fall in.

Lieut.-Col. Bolton, in his report on the Metropolis Water Supply for the month of September, repeats his complaint as to the deterioration of the water by the generally neglected state of the house cisterns. Hence the practical importance of the constant supply system, concerning which we observe that a member of the Newington Vestry has been summoned to the Lambeth Police Court for neglecting to provide proper fittings for the reception of the constant supply in a number of houses of which he is the proprietor. The Vestryman having no defence, abused the Company, whom he accused of having a "spite" against him. It appeared, however, that the Company had so far got the worst of it, as the Vestryman had managed to waste their water to the value of £25. As in thirteen months he had failed to execute the necessary works, he was allowed fourteen days longer. Irrate under the pressure of the law, the defendant declared that "the days of the Water Companies were numbered, and 'they knew it.'" We presume this gentleman is not one of the Vestry Delegates who will hold their adjourned meeting at St. Martin's-in-the-Fields to-morrow, when the lack of the constant supply will possibly be again mentioned as one of the crying sins of the Companies. Another matter, receiving passing reference in Lieut.-Col. Bolton's report, is that of hydrants, of which there are now 5383; but 3009 are for private purposes. Thus slowly does the public use of these appliances extend, for the purpose of protecting the Metropolis against fire. As many as 727 miles of streets have mains constantly charged, "and upon which fire hydrants 'could at once be fixed.'" The "authorities" have only to give the word; but the word is not given, except in the City, and in a few limited cases elsewhere. The Corporation have written to the Metropolitan Board, stating that the system of fire hydrants in the City is now complete, and asking what the Board have done, as well as "what more" they propose to do, in order to utilize the said hydrants for the extinction of fires. Respecting the drinking supply of the last month, Lieut.-Col. Bolton states that the "organic matter," concerning which Dr. Frankland has been so perturbed, was principally due to "vegetation brought down by flood waters." This is a common-sense view of the matter; but scientific analysis is nothing without carbon and nitrogen.

Science has rendered service to the Water Companies by demonstrating that milk, and not water, is the source of sundry painful epidemics. It may be suggested by the opponents of the Companies, that as milk often contains a considerable proportion of water, the accusation against the former does not exempt the latter. But we may unhesitatingly affirm that if the water supplied by the London Companies had been found in recent years to occasion one-half the mischief considered to be proved against milk, public indignation on the subject would have gone beyond all bounds. The inhabitants of the Metropolis are now warned that milk from Oxfordshire has conveyed scarlet fever to Paddington. Our readers may remember the case of the Town Crier of Derby, who was called to account for warning the people of that town to "boil the water" supplied from the town reservoirs. Dr. Stevenson, the Medical Officer of Health for Paddington, says nothing about the water, but he says, "Boil your milk."

The painful discussions which have been going on for some time past in the Manchester City Council, with reference to the irregularities in the keeping of the water-works accounts, have been at length apparently brought to a close. The duties of the department have been re-arranged, the outdoor work being separated from the indoor. The latter,

including all book-keeping and financial matters, will be under the superintendence of Mr. Charlton, while Mr. Berrey will have charge of the outdoor operations. The report of the Committee which recommended these changes was unanimously adopted; but Alderman King signified amid considerable interruption, that he should have preferred a fuller investigation of the accounts. Mr. Berrey's salary undergoes a reduction by this new arrangement, but his duties will be materially lightened.

The Hillé system for the treatment of sewage has been adopted at Birkdale, and the works have been recently opened by a visit from the Local Board. Hillé's system is a combination of chemical treatment and filtration through land, or, in other words, precipitation and sewage farming. The plan has been found to answer very well in the case of several small towns, and has the reputation of treating the sewage effectually without creating a nuisance. Mr. Hillé has the merit of being a modest inventor, making no very great pretensions, but generally giving satisfaction. The sewage farm is not a necessary adjunct to his process, and where a large river is at hand, the effluent may be discharged direct from the depositing-tanks.

Last week we made reference to the method of burning town refuse invented by Mr. Alfred Fryer, of Nottingham, and adopted at Leeds and elsewhere. Some interesting details on the practical working of this invention have recently been laid before the Paddington Vestry by Mr. George Weston, the Superintendent of the Works Department. In accordance with instructions received from his Vestry, Mr. Weston visited Leeds, where Mr. Fryer's apparatus was at work, and made himself acquainted with its merits. There are two appliances concerned—one called the "carbonizer," and the other the "destructor." The carbonizer is adapted for the conversion of sweepings from paved streets, offal, vegetable and stable refuse, and all combustible waste, into a finely powdered charcoal, forming an effective manure and deodorizer, and selling readily at from 27s. to 30s. per ton. The ash withdrawn from the furnace sells at 2s. 6d. per load. The Leeds carbonizer is a brickwork structure containing eight cells or furnaces, each cell carbonizing fifty hundred-weight of material in twenty-four hours, the fuel used for the furnace consisting of soft coal and rough dust. The destructor is also built of brick, securely tied with iron, and has six furnace cells. The contents of dustbins and middens, with garbage of all kinds, are tipped into the furnaces from a platform at the summit. At intervals of about two hours, clinkers, iron pots, tinware, broken pottery, fused glass, and other incombustible matters, are withdrawn at the foot, and a further charge of refuse is shovelled in at the top. Each of the six cells is capable of destroying seven tons of materials in twenty-four hours; that is to say, the process of destruction goes so far as to reduce the bulk to about one-sixth, and the weight to about one-fourth. One cell in two is provided with an opening for introducing directly on to the fire infected mattresses and bedding, diseased meat, and other unwholesome articles. The gases generated in the combustion which goes on inside the destructor are all made to pass into the fire, so as to avoid any risk of their conveying infection to the neighbourhood. The waste heat on its way to the chimney-shaft passes through a multitubular boiler generating enough steam to drive a fourteen-horse power engine, working two mortar-mills. The clinkers mixed with lime are ground into a highly tenacious mortar, selling at 5s. per ton, as stated last week. The tin pots, cans, and other matters, sell at 20s. per ton. It is stated that throughout the whole process, whether of charging, burning, or withdrawing, no unpleasant odour escapes; neither does the chimney emit smoke. All the town refuse is thus disposed of without any nuisance to the neighbourhood. The carbonizer and destructor are worked night and day, the furnaces not being allowed to go out more than three or four times in the course of a year. This system of dealing with town refuse is understood to be extending, and is already in operation, in a greater or less degree, at Manchester, Birmingham, Rochdale, Stafford, Heckmondwike, Blackburn, Bradford, Bury, Warrington, and Jarrow, as well as at Leeds. We presume Paddington will soon be added to the list. The Leeds apparatus cost £4270, to which has to be added a royalty of £150 to the patentee, and £1460 for the land.

THE STOCKTON AND MIDDLESBROUGH CORPORATIONS WATER BOARD.—On Wednesday last a private meeting of this Board was held at Middlesbrough. After considerable discussion it was agreed to recommend the Town Councils of Stockton and Middlesbrough to go to Parliament for powers to carry out what is known as Mr. Mansergh's No. 2 scheme, which, for obtaining an additional supply of water, will involve another outlay of about £200,000.

GAS LEGISLATION FOR 1880.

WE commence to-day our usual annual abstract of the Acts of Parliament passed each session, having reference to gas and water supply, &c., by noticing that during the sessions of 1880 only two Gas Companies were incorporated with statutory powers, as compared with five so incorporated in 1879. Both Companies are located in Yorkshire. The Acts contain the following provisions:—

The *Ackworth, Featherstone, Purston, and Sharlston Gas Act* dissolves and re-incorporates a limited Company formed in 1873 for the supply of gas to the places named. The original capital of the Company was £10,000, divided into 2000 shares of £5 each, and there was no mortgage debt. The capital of the incorporated Company is to be £30,000, whereof £10,000 is to be called the original capital, and £20,000 is called the additional capital. The original capital is divided into 1000 shares of £10 each, and the Company are to convert into stock the whole or any part of their original capital when fully paid up, and may issue as stock, or convert to stock when paid up, the whole or any part of the additional capital; the additional capital is to be issued as required in the form of new ordinary or preference shares or stock, of not less than £10 unit value. Not more than £4000 worth of new shares or stock is to be issued during any one year, but the rate of issue may be average over several years, so as not to exceed that amount per year, although not actually created in every year. The Company are also empowered to borrow £2500 on mortgage in respect of the original capital, and also to raise on loan in respect of the additional capital any sums not exceeding one-fourth of the amount of such capital actually issued and at least half paid up. Money so borrowed may be converted into capital, provided the dividends to be paid on the same are limited to five per cent. per annum. The Company may also create and issue debenture stock. The standard dividends of ten per cent. on the original capital, seven per cent. on the additional capital, and six per cent. on any preference capital, are provided, and the sliding scale is imposed with an initial price of 5s. 6d. per thousand cubic feet. The auction clauses are also enforced for all issues of new capital, with the usual provision for the application of the premiums realized. The formation of an insurance-fund, with an annual appropriation of one per cent. on the paid-up capital, is also authorized, such fund to be made up to one-twentieth of the paid-up capital for the time being. Surplus profits after payment of dividends and insurance are to be carried forward, except, by reason of a reduction in price, increased dividends are payable, and in that case a reserve-fund may be formed, at the discretion of the Company, which will be available for the purpose of equalizing dividends. The Company may manufacture and sell residuals, and manufacture, purchase, hire, or sell and lend gas-fittings and stoves, or take out licences for the use of patented inventions. Gas is to be supplied at a pressure of six-tenths from midnight to sunset, and eight-tenths from sunset to midnight, of fourteen candles illuminating power, as tested by Sugg's "London" Argand, No. 1, and a testing-place is to be provided at the works. Interest is to be paid on money deposited as security by consumers. The usual formal clauses are inserted for continuing the rights, powers, and liabilities of the limited Company to the incorporated Company.

The *Malton Gas Act* dissolves and re-incorporates the Malton Gaslight and Coke Company, which was formed under a deed of settlement in 1836, for lighting with gas the town and vicinity of New Malton, in the North Riding of Yorkshire, and was subsequently registered under the Companies Act, 1862, but not as a limited Company. The share capital of the Company stood, when the present Act was passed, at £24,000, divided into 2000 shares of £10 each, all allotted, and £18,067 10s. paid up, leaving £5932 10s. to be called up; and the registered Company had not borrowed any money on mortgage or debentures, and had no debts. The Act fixes the original capital of the Company at the amount of the old shares, and permits the raising of additional capital to an equal amount by the issue of new ordinary or preference shares or stock; and £4000 of the new capital may be issued during the year following the passing of the Act, and an average of £3000 in each subsequent year. The auction clauses are enforced for all issues of new capital. The Company may raise on mortgage the total sum of £6000 on the old capital, and an equal amount on the additional capital, provided that the aggregate amount so borrowed shall not at any time exceed one-fourth part of the amount of such additional capital paid up for the time being. No moneys so borrowed shall, if converted into stock or shares, receive more than five per cent. per annum. The dividends

on the additional capital are limited to seven per cent., or six per cent. on preference capital, and the sliding scale is applied with an initial price of 4s. per thousand cubic feet; a one per cent. appropriation for an insurance-fund being authorized, and a discretionary reserve-fund also permitted when the rates of dividend are increased. The Company take general powers to manufacture and sell residuals, and to let on hire gas-fittings, &c. Power for taking additional land to the extent of two acres, when required, is also granted, but not for the purpose of manufacturing gas or residual products thereon. Fourteen-candle gas is to be supplied at six and eight tenths pressure, from midnight to sunset and sunset to midnight respectively. Sugg's "London" Argand burner, No. 1, is to be used for testing, and a testing-place is to be provided at the works within six months. Interest is to be paid on money deposited as security by consumers. The usual formal provisions are included in the Act.

Two Acts affecting Metropolitan gas undertakings were passed during the sessions, one being the Bill of the Corporation of the City of London and the Metropolitan Board of Works, in accordance with the provisions of the Metropolitan Management Act, 1855; and the other an application by the London Gaslight Company for special powers.

The *Gaslight and Coke and other Gas Companies Acts Amendment Act* is an Act to make further provision for regulating the supply of gas by The Gaslight and Coke Company, the Commercial Gas Company, and the South Metropolitan Gas Company, and to amend the Acts relating to the said Companies. It chiefly relates to the official testing of the gas supplied by the Companies, and repeals and re-enacts in a concise form certain sections of their different private Acts. The Gas Referees are empowered to visit the testing-places, and ascertain the condition of the testing apparatus. The Referees are also instructed to prescribe the mode to be adopted for testing and recording pressure, and the tests are to be made as and where appointed by the controlling authority. The fine for deficient illuminating power remains at 40s. for the first half-candle; but is made for the first and every subsequent candle a sum not less than £25 and not exceeding £100. The fine for excess of impurity is still £50, but only one such fine can be recovered from one Company on any day. The fine for insufficiency of pressure is also made recoverable for only one default in any period of 24 hours. Reservation is made in favour of the Companies in cases of defect arising from unavoidable accident. The costs of obtaining the Act are to be paid by the Corporation and the Metropolitan Board.

The *London Gaslight Act* authorizes the Company to buy or hire, and to supply, sell, or let to consumers of gas within their district, burners, tubes, stoves, or ranges for cooking by gas, and any other domestic gas-fittings, and also gas-engines and motors, and all necessary fittings and machinery for use in connection therewith; and to charge such price, rent, or sum for the same as may be agreed upon between the parties. The Company take powers to obtain licences for working patented inventions, and to use any process in connection with the manufacture or distribution of gas, and for the conversion and utilization of residuals. Separate accounts are to be kept of all business done under the Act, and a capital of not more than £20,000 may be employed for the purposes recited.

(To be continued.)

THE USE OF GAS IN LIGHTHOUSES.

(Concluded from p. 648.)

It will be remembered that when we left this subject last week, we had carried the correspondence that has recently taken place, between the Board of Trade, the Trinity Board, and the Commissioners of Irish Lights, respecting the improvement of the light on Copeland Island, down to the time when the Board of Trade had replied to the statement placed before them by a deputation of the Irish Commissioners, and asked for a revised estimate to be sent them of the first cost of introducing gas at Copeland Island (including the first cost of a fog signal), and also of the annual cost of maintenance. To this request Mr. W. Lees, the Secretary to the Commissioners, replied, on the 10th of April last, in the following terms:—

I am directed by the Commissioners of Irish Lights to forward, for the information of the Board of Trade, the statement Mr. Wigham, in answer to the criticisms passed upon his calculations relative to the cost of gas in its various forms, which appears to the Commissioners to explain so very clearly the apparent discrepancies between Mr. Wigham's former statement and the remarks made on it by the Board of Trade, that they feel they have nothing to add to it.

I am, however, desirous to observe that the allegations of the Board of Trade relative to the very much greater average cost of the six lighthouses in Ireland where gas has been introduced, compared with the cost of maintaining a station where mineral oil is used, have caused the Board to inquire closely into the relative actual cost of lighting with gas and oil.

The Board have not any 6-wick burner oil lamp, and they cannot, therefore, from their own accounts, institute any comparison between gas and

oil applied in that form; but they have compared the average actual cost of lighting three first-class mineral oil lights with 4-wick burners, being the only lights of that sort which have been in use for more than twelve months, viz.,—Killybegs (St. John's Point), Ballycotton, Kinsale (Old Head), and five similar first-class gas lights, viz.,—St. John's Point, County of Down, Ballycotton, Hook Tower, Wicklow Head, Minchmouth (Howth Bailey being omitted in consequence of the many gas experiments that have been made there); and the result of their investigations is as follows:—

Average actual cost of maintaining five gas-lighted stations with a maximum of 2923 candles, for the year ending March 31, 1879	£364 13 8
Average actual cost for the same period of maintaining three stations lighted with 4-wick mineral oil lamps, with a maximum of 329 candles	297 8 9

Excess of gas £67 4 11

The above comparison is made with respect only to the annual cost of maintaining each description of light. The original outlay for erecting the gas apparatus is larger than that for the appliances necessary for oil; but the Commissioners are of opinion that the superior efficiency of the gas illuminant, capable of a tremendous increase, in emergency, from 429 to 8769 candles, as against 732 candles (the highest illuminating power obtained from oil, entirely justifies, in the case of important lights, the additional first cost and the increased amount of annual maintenance.

With respect to the Copeland Island light, the estimate of Mr. Douglass (the Board's Engineer) for erecting the necessary works for an oil light (6-wick burner, with siren, and calorific engine was, £2,187 18s. 2d., and for a gas (one light), with gas siren, £4937 6s. 9d.

On revision, Mr. Douglass now thinks that, in consequence of the rise in the price of metals, the estimate for a mineral oil light should be increased by £140, making the same £2,327 18s. 2d., and the gas station should be increased by £159, making the estimate now £5038 6s. 9d.

Mr. Wigham's tender for the whole expense to be incurred in lighting with a triforium gas light and gas siren, as in his proposal of Sept. 18, 1879, is £8930

Less if allowed to utilize an existing house of which the Board approves 500

£8430

Appliances for lighting "Mew" Island and "Briggs" Rock, and providing a temporary light to be used during the construction of the works, of equal power with the present light, as since suggested by the Board. 475

£8905

The comparison of mineral oil with gas cannot be fairly instituted, without taking into account the enormously increased power which can be obtained with gas, and in consequence, in the use of the latter light.

For lights in less important positions, mineral oil may answer, but for grand leading lights, or in particularly dangerous localities, there can be no question as to the superiority of gas as an illuminant; the utmost extent of illumination of mineral oil being 732 candles, while that of gas stations, in triflorium system, to 8769 candles.

In clear weather a very low amount of illuminating power is sufficient to show on the horizon, such as that of a 4-wick mineral oil burner, or its equivalent, a 28-jet gas-burner; but when danger really is imminent, and the highest amount of illumination known is required to save life and property in dense fog, then gas comes to the front, transcendently effecting, throwing out the fog (and when unable to pierce it, illuminating it) a light of 8769 candles, while the 6-wick mineral oil burner is choked and buried with its medium of 732 candles. In support of this statement, the Commissioners think it will be interesting to the Board of Trade to have before them certificates from practical mariners as to the efficiency of the gas light.*

The principle the Commissioners have invariably tried to carry out to the utmost of their power has been lately advocated by Mr. Farrer in his evidence before a Parliamentary Committee, where he stated that the cost of a gas station is nothing compared with the cost of a gas burner; and he added that "This was not only his own opinion, but the principle upon which the Board of Trade deals with such expenditure." Considering, therefore, the immense superiority of the illuminating power of gas under those foggy conditions of the atmosphere so frequent around our coasts, where the life of crews and passengers is at stake, and the balance, and everything, depends upon a glimmer through the surrounding darkness for the salvation of life and property, the Commissioners feel a confidence that the Board of Trade will no longer hesitate to grant them authority to proceed at once with a gas triflorium illumination at Copeland Island.

Mr. Wigham, in the letter mentioned above, writes as follows:—

I think the Board of Trade will find, on looking further into the parliamentary papers to which I refer, that my statement is not incorrect; that they will be fully fallen in with. It is supposing that the sum of £186 9s. 4d. represents the annual cost of a 28-jet burner consuming 51·4 cubic feet per hour, the consumption of the establishment being on an average 120 feet per hour. Mr. Valentin gives the true cost—viz., £115 18s. 10d.—and says: "The great advantage of the Wigham gas-burner consists not so much in its furnishing a somewhat cheaper light, as in its power to the oil light now in use, but in its capability of producing lights of varying illuminating powers, some of which have never been, and probably never will be obtained by oil lights; also in its adaptability for flashing purposes and signal lights. The higher-power lights come so much cheaper because the cost of making larger quantities of gas, which is represented by wages, interest on plant, &c., remains pretty well the same. It is here, in fact, where its undisputed advantage lies. This becomes clear at once if the hourly consumption of gas be taken as 120 cubic feet, a consumption which both Mr. Douglass and Mr. Wigham are agreed upon to be sufficient for clear weather as well as foggy weather." Dr. Tyndall says in reference to this subject: "There is one point in connection with the 28-jet burner only, which, in justice to its inventor, I must here signalize. Anxious to give the Elder Brethren the maximum of information, Mr. Valentin has stated, in a table, the cost of the 28-jet burner, supposing it to be pitted at Haisbro' against the 4-wick lamp. In that table he debits the small burner with the whole of the gas-makers wages, and with the whole of the interest on £1685 6s. 9d. Now the gas-maker is there not to produce gas for a 28-jet burner only, but for a series of fog burners culminating in a set of 108 jets. He manufactures 2000 cubic feet of gas in the furnace at a cost of 120 cubic feet an hour. Were it, moreover, proposed to erect works for a 28-jet burner, an idea to my knowledge not entertained, a fraction of £1685 6s. 9d. would cover the cost." It will therefore be seen that the Board of Trade are mistaken in supposing that the annual cost of the triflorium burner at Copeland, where three 28-jets are used for foggy weather, would be £207 4s. 2d., and when three

49-jets are used £292 9s. 9d., the real cost being £162 16s. and £212 6s. respectively, as stated by me.

With respect to the general question of the cost of gas as compared with oil, it was shown at Haisbro' that gas was much cheaper than coal oil, even without taking into account its superior illuminating power. I thought it was clearly understood that the investigation at Haisbro', which was ordered by the Board of Trade, was to be considered final and conclusive on that point. I believe that Dr. Tyndall, Mr. Valentin, Mr. James Douglass, and myself, endeavoured to make it so, and took great pains to demonstrate the true cost, not on any theoretical basis, but by actual practice, and with this view the process of manufacture was carefully watched and noted day after day for a very considerable time. I am perfectly confident that the cost of using gas for lighthouses was then really arrived at, of course subject to variation in the price of coal, &c., and, if, as stated by the Board of Trade, the accounts of six gas stations in Ireland show a greater cost than stations where mineral oil is used, gas being charged with interest upon the original outlay, and the money paid to me for patent rights, I can only suppose, in the absence of any data as to the nature of this excess—1st. That perhaps the system of manufacture originally fixed upon at Haisbro' is not adopted. [You are aware that some time since I formally offered to secure this, and ensure that the proper cost should not be exceeded, by contracting to supply gas at all your stations, and I am still willing to enter into some such arrangement, should you think it desirable.] 2nd. That the cost of preliminary experiments, as well as the cost of patent rights, is included in what the Board of Trade term original outlay. This, I think, bears more hardly on gas than on oil lights, with which from time to time there have also been many experiments, without, so far as I know, debiting them with interest. But even supposing it is considered right to adopt this course, and that there is this excess of cost, which, in my mind, ought not to exist, I respectfully submit that the sum of £115 18s. 10d. which the Board of Trade say is the excess of gas over mineral oil (6-wick burner) is not extravagant when the greater illuminating power of the gas is taken into account. The 4-wick lamp is quite sufficient to show light at the horizon to the mariner in clear weather, and it is evident that it is only in thick weather that a superior light is required. The Board of Trade have recognized this in sanctioning the use of the 6-wick lamp in place of the 4-wick lamp, at an increased annual expenditure of £91 to gain a maximum increased illuminating power of 394 candles—the difference between the illuminating power of the 4-wick and 6-wick lamps. It is perhaps, therefore, not unreasonable for me to suppose that they should not object to an expenditure of this £129 to secure further increased illuminating power of 2201 candles (the difference between the maximum illuminating power of the 6-wick lamp and that of the gas lights in Ireland), especially when for a very small additional cost they may secure, by the use of the triflorium, a greater light than that of the 6-wick oil lamp by more than 8000 candles. You are aware that these figures as to illuminating power are not for the gas stations fixed at Haisbro', as was also the table of cost upon which my statement is based, which includes interest on outlay and all renewals of apparatus, is based.

The following is a summary of the revised estimate of cost for which the Board of Trade asked, the particulars being set forth:—

Estimated Cost of altering present Light to a First Order Fixed Dioptric Light.—Cost of Works for Burning Gas in a 28-jet Burner, in Triflorium, with a powerful Siren driven by a Gas Engine; and for Burning Mineral Oil in a 6-wick Burner, with a powerful Siren driven by a Caloric Engine.

	Gas (28-jet Burner in Triflorium, with Siren driven by Gas Engine).	Mineral Oil (6-wick Burner, with Siren driven by Caloric Engine).
Cost of works	£10,398 18 0	£8610 13 2
Annual maintenance	£158 18 2½	£248 2 6
Ordinary repairs	167 18 2	138 9 4
Special repairs	138 9 5	121 9 2
Totals	£810 5 9½	£908 1 0

Accompanying Mr. Lees's letter, given above, was a statement—prepared by Mr. Douglass for the information of the Deputation from the Board of Light Commissioners to the Board of Trade—showing the estimated cost of a 28-jet triflorium light, with fog signal driven by a gas engine, for Copeland Island, based on the average amount of extra gas consumed during fog at three stations. Mr. Douglass says:

This extra amount is very much below the amount usually estimated, my calculation being for the single burner, using the 28-jet in clear weather, the 68-jet for 360 hours, and the 108-jet for 360 hours, 158,400 cubic feet, whereas the average amount for Hook Tower, Minchmouth, and St. John's Point is only 22,697 feet. Therefore, as the average single burner system was an average of eight and a half stations, I have added the latter amount only to that consumed by a single 28-jet burner for 3692 hours of clear weather. Thus—

3692 hours clear, at 50 cubic feet per hour	Cubic Feet. 184,600
Amount actually consumed during fog at three stations	22,697

Total quantity 207,297

Total for triflorium system 274,600

Increase for triflorium 67,303

If the full estimated quantity for fog was burnt at the different stations, there would be a decrease in favour of the triflorium system of 63,400 cubic feet.

Some correspondence afterwards took place as to some minor details of the tender sent in by Messrs. J. Edmundson and Co. for executing the necessary work, and these having been arranged, the following letter (which closes the correspondence) was sent by Mr. T. H. Farrer, on behalf of the Board of Trade, to the Commissioners of Irish Lights:—

I am directed by the Board of Trade to acknowledge the receipt of your letter of the 10th ult., further on the subject of the proposed improvement in the lighting of Copeland Island, Ballycotton, and more especially on the comparative cost of mineral oil and gas illuminants.

The Board have carefully considered the observations of the Commissioners of Irish Lights on this subject, the further communication of Mr. Wigham, the relative estimates and tenders, and the remarks of Mr. W. Douglass thereupon.

* Letters from 11 sea captains are published, all bearing out this statement.

I am now to state that under all the circumstances, and having regard to the representations of the Commissioners, the Board of Trade sanction the establishment of a gas light and siren fog signal at Copeland Island, and are prepared to approve of the necessary outlay, estimated by Mr. Douglas to amount to £10,888 18s., for carrying out the alterations in the present light, and construction of the requisite gas-works.

The Board of Irish Lights, it will thus be seen, gained their point; and, looking at the facts brought out in the course of this interesting correspondence—the cheapness of gas compared with paraffin oil, besides its very much greater illuminating power—it appears strange indeed that the Board of Trade should have had any hesitation in adopting a light so enormously superior in illuminating power, and of such small cost, as gaslight for lighthouses has now been proved to be.

Notes.

[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

A COLOUR TEST FOR AMMONIA.

Professor R. B. Webster, of Norfolk, Virginia, described at the recent Boston meeting of the American Association for the Advancement of Science, a process for the quantitative analysis of ammonia solutions by a solution of ferric gallate and ferric oxalate. A solution of ferric sulphate is first prepared, and having been decomposed by the addition of gallic acid, the resulting black ferric gallate is further partially decomposed by oxalic acid, until the colour is reduced to a bluish-black tinge. A suitable quantity of the reagent thus obtained is added to a solution of free ammonia, or carbonate of ammonia, in the same way that Nessler's solution of mercuric per-iodide is used in Wanklyn's process. The result of this mixture is the combination of the ammonia with part or all of the oxalic acid of the colourless ferric oxalate of the reagent, and the blackening of the solution by the re-forming of ferric gallate. The practical estimation of ammonia by this process is by an imitation of a standard solution of ammonia with the reagent, as in Wanklyn's mode of Nesslerizing. When the solution to be tested and the imitation solution correspond in colour, it is inferred that they contain equal quantities of ammonia. In this process the standard ammonia test solution should be made from the carbonate, and may be of such strength that one litre shall contain one milligramme of ammonia, or one part in a million. Another and more direct way of estimating ammonia is by adding a standard test solution of oxalic acid to the blackened solution of the reagent and liquid to be tested, till the original colour is produced, and from the known quantity of oxalic acid used, to calculate the quantity of ammonia in the resulting oxalate. This method is described as convenient and sensitive.

THE ENRICHMENT OF COAL GAS BY PETROLEUM GAS.

A correspondent of the *American Gaslight Journal* gives some particulars respecting the use of petroleum for enriching coal gas; and incidentally refers to the result of attempts on the part of some American gas companies to use mineral oil as a gas-making material in the place of coal. It is natural that, with such vast supplies of petroleum at hand, gas companies favourably situated with respect to the oil wells should have had their attention seriously occupied with the practicability of producing gas economically from liquid hydrocarbon; but the experience of a great number of these companies has not been conducive to the spread of petroleum gas manufacture. Our contemporary's correspondent states that in consequence of a sudden rise in the price of coal last spring, a thorough trial of petroleum as an auxiliary was determined upon by the president of the company with which he was connected, and the results he obtained at that time were not discouraging. With coal yielding 10,371 cubic feet of 16-1-candle gas per ton, he used oil of 57° specific gravity, and with 32.8 gallons of this oil to the ton of coal he produced 15,704 cubic feet of 17-7-candle gas; and with 39 gallons of oil to the ton he obtained 14,672 cubic feet of 18-candle gas. The first of these results is the average of eight days, and the second of twelve days trial. Making gas from the oil alone, and reducing its illuminating power with air, was tried, but soon discarded as a hopelessly extravagant proceeding. As the first of the two recorded trials proves, the difference between 10,371 cubic feet of 16-1-candle power, and 15,704 cubic feet of 17-7-candle power, or an increase of 5333 cubic feet of 17-7-candle gas, was due to the 32.8 gallons of oil, besides the raising of the remaining 10,371 cubic feet originally due to the coal from 16-1 to 17-7 candle power, or an increase of 1.6 candles. The value of the oil is therefore 168.2 cubic feet of 17-7-candle gas per gallon. The company in question are now working constantly with oil or naphtha of 71° specific gravity, and with still better results. The necessary arrangements for making the oil gas are described as being extremely simple and non-patented, consisting principally of a piece of 3-inch pipe and a few fire-bricks, forming a retort and furnace.

ARTIFICIAL INDIA-RUBBER FROM COAL TAR.

According to *Ackermann's Gussverbreitung*, an inexpensive and efficient substitute for india-rubber or gutta-percha has been found. It can be used, either alone or in combination with resinous substances, as an electrical insulator, or for other purposes for which the genuine materials named have alone been suitable. The composition is elastic, tough, not so sensitive to external influences as india-rubber or gutta-percha, and is not injured by pressure or

high temperature. The base of the compound which possesses these remarkable qualities is coal tar oil, or equal parts of coal and wood tar oil, in quantity equal to a third part of the whole mixture. This tar oil is poured into a large kettle, together with an equal quantity of hemp oil, and is heated for several hours, either by steam or over an open fire, to a temperature ranging from 252° to 288° Fahr., beyond which it must not pass. The mass becomes at length so ductile that it can be drawn out in long threads, and the remaining third portion, consisting of linseed oil which has been thickened by boiling, is then added. With this compound from 5 to 10 per cent. of ozokerite and some spermaceti should be mixed; after which the mass is heated again for some hours at the same temperature as before, and finally from 7 to 12 per cent. of sulphur is added. The composition is then cast in moulds and worked up the same as india-rubber. By slightly varying the proportions of the three oils of which the substance is principally composed, its character may be modified in various ways according to the practical purposes for which it is required.

THE TEMPERATURE OF FLAMES.

In the *Annales de Chemie et de Physique* there have recently been published the results of some experiments carried out by Mons. F. Rosetti to determine the respective temperatures of the flames of (1) an ordinary gas-burner; (2) a Bunsen burner; and (3) an electric light generated by means of a thermo-pile and a delicate reflecting galvanometer. With the temperature of the air at 59° Fahr. (15° C.), the ultimate temperature of the white flame at the outer edge of an ordinary gas-burner was 2370° Fahr., while that of the interior blue flame was 2100° Fahr.; the average temperature of the flame being fixed at 2170° Fahr. The ultimate temperature of the flame of a Bunsen burner was determined to be 2280° Fahr. The electric light gave as a maximum intensity of heat: For the positive pole, 7050° Fahr.; for the negative pole, 6700° Fahr.; for the arc itself, 8700° Fahr. In reference to these results, "B," writing in the *Journal of the Franklin Institute*, from whom the above is quoted, says: "There is still wanting an accurate measure of the quantity of heat emitted by the electric light to compare with the heat equivalent of the electro-motive force expended in the arc, and thus to eliminate the expenditure of heat in the production of light."

THE ABSOLUTE INVISIBILITY OF ATOMS AND MOLECULES.

Atoms and their aggregates—molecules—are being constantly mentioned by chemists and physicists, and the interest necessarily attaching to these ultimate subdivisions of matter may be held to excuse a natural curiosity as to whether they will ever be made visible to the human eye. Dr. Dolbear essays to answer this inquiry in the negative, in a recent number of *Science*, an American publication. According to the note in question, Mulder states that a molecule of albumen, selected as a typically complex substance, contains 900 atoms; and a molecule of alum contains 100 atoms. Assuming that atoms arrange themselves into molecules in agreement with the three dimensions of space, and that a good microscope of modern construction will define the 4000th of a millimetre, a microscope of fifty times greater power would render a molecule of albumen visible, or if its power could be increased 107 times, it would enable one to see a molecule of alum. According to Helmholtz, it is probable that interference will limit the visibility of small objects; but if he should be in error, Dr. Dolbear states that there are two other conditions which will prevent our ever seeing a molecule. First, the motion of molecules is extremely rapid. A free molecule of hydrogen at the temperature of zero (centigrade), and at a pressure of 760 millimetres of mercury, has a free path about the 10,000th of a millimetre in length, and a velocity therein of more than a mile per second. As only a glimpse of an object moving no faster than one millimetre per second could be obtained by the microscope, the rate of motion as stated would render the moving molecule quite invisible. Again, supposing a molecule could be held in the field of vision so that it could have no free path, it still has a vibratory motion which constitutes its temperature. The vibratory motion is measured by the number of undulations per second it sets up in the ether, and will average 5000 millions of millions—a rate of motion that would make the space occupied by the molecule visibly transparent; that is, it could not be seen. The transparency of the molecule is the second reason for its absolute invisibility. From the small obstruction to light and heat offered by the atmosphere, signifying little power of absorption on the part of its constituent gases, Dr. Dolbear argues that their separate molecules would be too transparent to be seen, even though their magnitude and motions were not absolute hindrances.

AMERICAN GASLIGHT ASSOCIATION.—From the issue of the *American Gaslight Journal* of the 16th ult., received by yesterday's mail, we learn that the eighth annual meeting of the American Gaslight Association was held in Chicago, Ill., on the 13th, 14th, and 15th of October. The chair was occupied by the President, Mr. Wm. H. Price, of Cleveland, Ohio. The meeting was one of the largest and most complete that was ever held by the Association, 125 members being present. The following gentlemen were unanimously elected as Officers of the Association for the ensuing year:—President—Wm. H. Price; Vice-Presidents—A. Hickenlooper, Theobald Forstall, Wm. A. Steiman; Secretary—Wm. Henry White; Finance Committee—John S. Chambers, A. B. Slater, Geo. S. Hookes; Executive Committee—Henry Cartwright, F. C. Sherman, A. C. Wood, Peter T. Burtis, T. Littlehales, Samuel Pritchett. The President's address was very able and thoroughly practical, and well suited to the times. The papers read treated of the following, among other, subjects:—"Stopped Stand-Pipes," "Mechanical Stoking," "Furnaces," "Burners," "Gas-Engines," "Illuminating Power for Compensation," "Coal Tar," "Heating by Gas," and "Water Gas."

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

MR. G. LIVESEY ON THE ECONOMY OF CARBONIZATION.

SIR,—Having read with much interest Mr. Livesey's article on the important question of the "Economy of Carbonization," and the correspondence to which it has given rise, I would ask you to allow me to contribute a few remarks on the subject.

In your last issue Mr. Sidney E. Stevenson gives an estimate of the result of producing an extra 500 cubic feet of gas per ton of coal carbonized, which at first sight appears to differ widely from the previous calculation of Mr. Livesey; but this difference is mainly due to Mr. Stevenson taking the *selling* price of the extra quantity, instead of its *cost* price. Instead of estimating the additional cost of the increased quantity of canal necessary to maintain a fixed illuminating power, I would suggest another mode of arriving at the result of an increased make—namely, by calculating the number of candle units obtainable from the same coal, on the assumption that 9800 cubic feet of 16-candle gas, or 10,300 cubic feet of 15½-candle gas, can be extracted, thus—

$$\begin{array}{r} 9,800 \times 16 = 156,800 \text{ candle units.} \\ 10,300 \times 15\frac{1}{2} = 159,650 \quad \quad \quad \end{array}$$

showing a gain of 2850 candle units from the increased make; and taking the net cost of the coal, less residuals, at 6s. 8d. per ton, which is the last year's average of Metropolitan Companies, this gain of 2850 candle units would represent a money gain of about 1½d. per ton. I think after deducting from this the extra cost of fuel, wear and tear, &c., consequent upon higher heats, very little will be left, if the balance is not found on the other side.

This is, of course, viewing the question only from the point of higher heats giving an increased yield. Mr. Livesey very justly says that there is a clear gain, if an increased yield can be obtained from improvements in working; but I very much doubt whether high heats are to be classed under such improvements, and I quite agree with him that there must be "an economical maximum" beyond which it will not pay to go.

In your number for Oct. 19, Mr. G. E. Stevenson says that rapid carbonization, by means of high heats and light charges of short duration, evolves more light-giving constituents than slow distillation. This is undoubtedly true to a certain extent; but there must be a limit. It may be admitted that short light charges have this effect, but how far the addition of high heat contributes to it, is still doubtful to me; and against the benefits of short light charges, the extra cost of labour has to be considered. In my own experience, I have tried four and five hour charges, with hand labour, and have found it better to return to six-hour charges; but it is very possible that mechanical stoking may help to make shorter and smaller charges practicable, with improved results. C. GANDON.

Crystal Palace District Gas Works, Lower Sydenham,
Oct. 30, 1880.

SIR,—The question propounded by Mr. George Livesey, in your issue of Oct. 12, appears to have created quite a commotion amongst his colleagues; and it is to be hoped that it will be discussed in the interests of gas consumers as well as gas companies. If gas engineers can produce a better article, and supply it at a lower price than exists at present, they will confer a benefit on the public as well as on the gas companies shareholders.

It is admitted by some of your correspondents, who are practically engaged in the manufacture of gas, that the existing system might be improved both as regards the distillation of coal and the qualities of coal commonly used in its manufacture. You will scarcely find two gas engineers agreed as to the quality of any particular kind of coal, and "who shall decide when doctors disagree?"

It is evident, however, that Mr. Livesey's bias inclines in favour of distilling coal at a comparatively low heat; with the specific object of obtaining a better quality of gas, at some sacrifice in the quantity produced per ton of coal. I am of opinion that he is quite right. I believe that the distillation of coal at an excessive heat is not only destructive to the retorts and furnaces, but that the gas evolved in the later stages is of a very inferior quality; as are also the tar and ammoniacal liquor. The quality of the coke must also be seriously affected thereby. I am strongly inclined to the belief that if gas engineers would content themselves with a yield of about 9500 cubic feet of gas per ton of Newcastle coal, they would obtain better results. The gas would undoubtedly be of a superior quality; and so, I believe, would be the coke and tar.

The chief objection to the use of coke for domestic purposes is the difficulty and expense of getting it fairly alight in an ordinary fire-grate. When this is accomplished, another drawback occurs, for in a few minutes the fire dies away for want of substance or body in the coke; and, although it is hot, clear, and strong for a short time, yet it lacks the cheerful blaze and lasting power of a coal fire. This defect may, I think, be fairly attributed to the "sweating" the coal is subjected to in the retorts, with the results before mentioned. If coke were improved in quality, a good deal more of it would be used in London, and we should probably obtain the benefit of an improved atmosphere in addition to increased domestic comfort.

Returning to the debatable question of coals most suitable for the manufacture of illuminating gas, I would observe that (although it may be considered presumption on my part to say so), as gas engineers are not at all agreed on the point, they might perhaps find it advantageous to get out of the groove in which they have so long been running, and strike out a new course. Mr. Henry Woodall's letter in your issue of Oct. 22 plainly indicates the direction in which this course lies. By confining themselves to a particular colliery or district, gas companies do not derive the benefit which would probably accrue from a healthy competition amongst coalowners generally, if they felt assured that their produce would be fairly tested on its merits. Mr. Woodall refers to the possible exclusion of such qualities as unscreened coal, nuts, or slack, which latter is understood in London to mean small. I can state positively that the London Gas Companies are supplied almost

exclusively with unscreened coal (north country), and that if it were run over a 3-inch screen, 50 per cent., at least, would pass through, in the shape of nuts and small; and yet in the face of this fact gas engineers in the Metropolis scout the very idea of using either screened nuts or "rough small" (i.e., nuts and small together, just as raised from the pit) or small *per se*.

Is there "any just cause" or reason why screened nuts (or even "rough small"), if well cleaned at the pit, and made from a first-class Durham coal, should not produce both good gas and coke? I cannot help thinking there is none, and that simple prejudice on the part of gas engineers shuts a cheap and useful article out of their retorts. Mr. Livesey deprecates the use of expensive canal to raise the illuminating power of the gas made from ordinary Newcastle coal. Then why does he use it? Why not use canal of a cheaper description, and distil it in separate retorts, so that the coke could be kept apart from his ordinary produce and burnt under the retorts?

It is within my knowledge that canal coal of excellent quality can be delivered in London at 15s. per ton. This canal will yield 10,000 cubic feet of (at least) 22-candle gas, and about 10 cwt. of coke. This coke, from its compactness, is probably not adapted for domestic purposes; but, owing to the comparatively small quantity of ash it contains, would be found perfectly suitable for firing the retorts or for the generation of steam. A coke containing something like 90 per cent. of carbon *must be of value*, and the remaining residual products will probably be found fully equal, if not superior to those obtained from Newcastle coal. I leave it to gas engineers to decide the relative value of the above-mentioned canal compared with Newcastle coal or Boghead canal.

I take the illuminating power of the latter at the standard fixed by Mr. Livesey—viz. 30 candles. I am not *certain* that the prices I name for Newcastle coal and Boghead are absolutely correct, but they are, I believe, near enough for the purpose of comparison. I therefore ask those who are practically engaged in the manufacture of gas from coal: What is the relative value of Newcastle coal, producing 10,000 cubic feet of 14-candle gas, and 12 or 13 cwt. of coke, taking the cost at 13s. per ton, compared with canal costing 15s. per ton, which produces 10,000 cubic feet of 22-candle gas and 10 cwt. of coke, or Boghead canal, costing, say, 34s. per ton, and yielding 11,000 cubic feet of 30-candle gas and a coke of very little value?

As to the question of distilling coal at a high as against a moderate rate of temperature, there is probably no higher authority in existence than Mr. Livesey himself, and I have no doubt he will be able to deal with it effectually.

London, Oct. 29, 1880.

INQUIRER.

THE ORIGIN OF CANAL COAL.

SIR,—The origin of canal coal seems to have been the subject of various theories and speculations. It has been supposed by some, for instance, that the formation of canal has taken place where the mass of vegetation has been well macerated by water before its final submergence and solidification. The agency of heat, however, seems to account in the most rational manner for its formation.

It is now generally acknowledged to be a fact that the great majority of our coal seams have once existed in the form of dense growths of bog moss, ferns, and such like vegetation, which have accumulated for ages, after a similar manner to the peat which is now being laid down in places; the only difference seeming to be that, in the "carboniferous period," this kind of vegetation grew with much greater luxuriance and rapidity than before or since. These vast masses of peat have been afterwards quietly submerged, and other deposits of various kinds of strata laid thereon. The pressure and heat which the bed or beds must undergo when sunk deep in the earth's crust, would, as is well known, be very great. The lighter and heavier hydrocarbons in this case be partially set free; but, being unable to escape, these light-giving constituents would collect in greater abundance in the top than in the lower portions of the seam, and it is a remarkable fact well known to many that "tops" are more suited for making gas than "middles" or "bottoms."

In most coals a certain amount of the volatile constituents would be lost before the final solidification; and where but little was lost, there would the coal approach nearer to the quality described as canal coal. The coal-bearing strata of Scotland, for instance, would be less likely to be permeable to the gases than the coal-bearing strata of England. Hence the greater abundance of canal coal in the former may be accounted for.

That heat has been the agent in transforming the ordinary coal in some cases into a gas-making, is well known; and instances have occurred (in cases where the coal has been in contact with volcanic rock) where it has been possible to trace the same seam of coal through the various stages of cinder, soot, and anthracite, to bituminous coal.

If the above theory be correct, it should be borne out by other facts, and probably some other readers of the JOURNAL, more practically acquainted with the conditions under which coal and canal occur, will notice something either bearing out or militating against the theory.

Northwich, Oct. 27, 1880.

B. ASKEW.

UTILIZING THE WASTE HEAT OF RETORT-SETTINGS FOR THE GENERATION OF STEAM.

SIR,—I have perused with deep interest the paper by Mr. Jolliffe, of Sunderland, on "The Utilization of Waste Heat from Retort-Flues for the Generation of Steam," read before the recent meeting of the North of England Gas Managers Association. This has been my study for the last 20 years, and for some time past I have laid down plans for such experiments; but in provincial gas-works such experiments cannot be carried out without considerable cost, which one cannot always prevail upon directors to make. I have consulted a number of engineers and gas managers on the subject; but on all occasions grave doubts have been expressed: If I realized my object it would be at the sacrifice of my retorts, labour, and fuel.

Having to make extensions last year, a very good opportunity arose to give the long-cherished idea a practical trial. Obtaining permission

from my Gas Committee to fix two boilers, I consulted Messrs. Horsefield and Co., of Huddersfield, as to the best form and size for carrying out my views. We finally arranged for two cylindrical boilers to be constructed, 20 feet long by 6 feet in diameter, with two flues (2 ft. 6 in.) passing through each boiler, and both tubes intersected with three Galloway tubes. I took every possible care that the same were fitted with steam and water gauges, safety-valves, and also one of Hopkinson's blow-off alarm valves. Having my doubts as to realizing the object of my desire—the heat having to descend 10 feet from the retort flues to the bottom of the boiler—I arranged for the boiler to be fixed parallel to the main flues of the retort-beds, the heat first passing through the two centre tubes of the boiler, underneath the bottom, and along both sides and end thence to the chimney.

All arrangements being completed, I directed the heat, by dampers, from the retort flues, and in the course of twelve hours, I had the gratification of seeing 40 lbs. pressure recorded on the steam-gauge. Being sure of success, I then turned on the steam-valve, which conducted the steam to the engines—150 feet distance from the boilers—through a 4-inch pipe, it being in November, when I had six furnaces at work. I then had doubts as summer approached. Knowing I should have only two furnaces at work, I thought I should have to fall back upon the firing of my second boiler, which I had previously fixed on the old system; but, to my utter astonishment, I found that steam could be maintained at 40 lbs. pressure, and I then had to draw the damper for the surplus heat to pass up the chimney.

This boiler has now been at work eleven months. The heats of the retorts have not failed at any time; and better and more regular heats are maintained without extra fuel. The steam thus generated works two engines for the exhausters, a mortar mill, the ammonia and tar pumps, a "pulsometer," a cinder riddle, and it forces water 60 feet high to a scrubber. All this has been accomplished without the cost of one penny.

The saving by the adoption of this method for generation of steam being understood by managers of gas-works, that I can explain, if they consult Mr. Corbet Woodall's paper read before the parent Association in 1877, and referred to in Mr. Jolliffe's paper.

I believe a perfect method of utilizing waste heat is secured for the generation of steam. The principle is so simple that it can be introduced at the smallest or the largest gas-works, and must eventually revolutionize gas manufacturing when economy is considered.

FREDERICK BAILEY, Manager.

East Retford Corporation Gas-Works, Oct. 27, 1880.

HEAT OF COMBUSTION.

SIR,—The unit for the measurement of heat, described in your last issue, p. 644, is one of several which may have been chosen; but the heat developed by the combustion of diamond, &c., is not there stated in that unit, but in another one 1000 times greater. Expressed in the chosen unit, the heat developed by diamond is 94,800. Thus corrected, the statement is comparable with that of the approximate calorific power of anthracite—see p. 656—viz., for an equal weight, 60,000 units.

ENOCH EVANS.

Oct. 30, 1880.

Legal Intelligence.

SALFORD HUNDRED QUARTER SESSIONS.—WEDNESDAY, OCT. 27. *Before Mr. W. R. HIGGINS, Q.C.*

THE STRETFORD GAS COMPANY'S ACCOUNTS.

It will be remembered that this case was before the Court on the 6th and 7th ult. (see ante, page 567), judgment being postponed until this day. Mr. TAYLOR again appeared for the petitioners; Mr. NASH represented the Company.

The CHURCHMAN, in delivering judgment, said the petition was presented to the Court in April last, and came up for trial at the last intermediate sessions, when the matter was fully gone into. The Court was composed of Mr. Christie and himself, and they had the advantage of the presence of Mr. J. A. Russell for a short time during the first day on which the matter came on for the hearing. The arguments were concluded, and it was decided that the absence of Mr. Christie when judgment was given should make no difference whatever. The petition was presented to the Court by certain consumers of the gas manufactured by the Stretford Gas Company, and was preferred under the 35th section of the Gas-Works Clauses Act, 1847, 10 Vict., cap. 15. The prayer of the petition was that a reduction might be ordered by the Court in the price of gas supplied by the Company. All that was possible to be said on both sides was, he thought, well said. It then became the duty of the Court to look into the Act of Parliament on which the petition was based. Before referring to one or two sections of the Act, it might be sufficient to state that the Company had an Act which provided that the capital should be £100,000. One section of the General Act provided that "the profits of the undertaking to be divided amongst the undertakers in any year shall not exceed the prescribed rate"—that was to say, the rate prescribed by any Act of Parliament authorizing the company, and the amount of the rate was "capital"—or, where no rate is prescribed, they shall not exceed the rate of £10 in the £100 by the year on the paid-up capital in the undertaking, which in such case shall be deemed the prescribed rate, unless a larger dividend is necessary in order to make up the deficiency of any other previous dividend which shall have fallen short of the said year's rate." The meaning of this section appeared to be that under no circumstances should a gas company divide more than 10 per cent. They knew that Parliament, when companies went for power to raise additional capital, partially by limited the amount of the dividend to something less than 10 per cent., and therefore he thought it might be taken that under no circumstances, that 10 per cent. was the percentage to be paid. In case no percentage was fixed, this was the dividend. At Stretford he understood that some additional capital was entitled to a dividend of 10 per cent., and other capital to 7 and 7½ per cent., respectively; therefore in their case the maximum dividends were respectively 10, 7½, and 7 per cent. Beyond these dividends the Company did not appear, either by their own Act of Parliament or the Act to which he was referring, to have any power to divide amongst themselves a greater sum in the shape of dividends than the 10 per cent. and 7½ and 7 per cent. in such cases. The Act of Parliament went on in the 31st section thus: "If the clear profits of the undertaking in any year amount to a larger sum than is sufficient, after making up the deficiency in the dividends of any previous year as aforesaid, to make a dividend at the prescribed rate, the excess beyond the sum necessary for such purpose shall from time to time be invested in

Government or other securities." He took it that the obvious meaning of this was, that after paying the maximum interest, whether it was 10 per cent. or any other rate of percentage, whatever there was over should be invested in Government or other securities, the whole meaning of the Act being that, as between gas companies and their consumers, the gas company should not pocket out of their profits a larger sum than that which made a dividend. The dividend was declared, and the Company would have recourse to the reserve-fund in order to make up the difference between the amount of the dividend paid and the maximum dividend to which they were entitled. Again, in case of any emergency arising, it was necessary that the Company should have invested a reserved sum to which the officers got the money necessary to carry on the work of the Company, so that the town or district should not be left in the dark—or, in other words, that the Company should have no excuse whatever for not being able to provide an adequate supply of gas by reason of the failure of funds. The section went on: "And if such fund be at any time exhausted, it if be at that time the duty of the Company to raise funds by back dividends or by taking a sum of money from it for any urgent matter"—"it may thereafter be again restored to the said sum"—that was the £10,000—"and so from time to time as often as such reduction shall happen." The 32nd section provided that "no sum of money shall be taken from the said fund for the purpose of meeting any extraordinary claim, unless it be first certified in England or Ireland by two Justices, and in Scotland by the Sheriff, that the sum so proposed to be taken is required for the purpose of meeting an extraordinary claim within the meaning of this or the special Act." That was to say, that before the money was taken from the reserve-fund, the officers of the Company, in the purpose of such claim, the fact that the money was wanted for such a purpose should be certified by two Justices in England or Ireland, and in Scotland by the Sheriff; in other words, it was provided that the public should be protected from the reserve-fund being improperly reduced. The section then said: "When such a sum shall be taken from the said fund, shall, by accumulation or otherwise, amount to the prescribed sum, or one-tenth of the nominal capital of the Company, as the case may be, the interest and dividends thereon shall no longer be invested, but shall be applied to any of the general purposes of the undertaking to which the profits are to be applied." The reason for this was, that it was obvious, and he need not refer further to it. The 34th section said: "If in any year the profits of the undertaking divisible amongst the undertakers shall not amount to the prescribed rate, such a sum may be taken from the reserve-fund as, with the actual divisible profits of such year, will enable the undertakers to pay the dividend of the said year, and the sum so taken at the time as often as the occasion shall require." In case they were not able to pay the maximum dividend in one year, they might in the next year have recourse to the reserve-fund. This brought him down to the 35th section, which read thus: "In England or Ireland the Court of Quarter Sessions, and in Scotland the Sheriff, may, on the petition of any two ratepayers"—and he understood that in this case the petitioners were gas ratepayers—"within the limits of the special Act, nominate and appoint some accountant or other competent person, not being a proprietor of any gas-works, to examine and ascertain, at the expense of the undertakers the amount of such expense to be determined by the said Court of Quarter Sessions or the Sheriff, the actual state and condition of the concerns of the undertakers, and to make report thereof to the said Court at the then present or some following sessions." After the petition in this case was presented, the Court appointed an Accountant to make inquiry, and that officer made a report to the Court. The Accountant said that he had examined the accounts of the Company, and any witnesses upon oath touching the truth of the said accounts and the matters therein referred to. Witnesses were examined on both sides. The section further said: "And if it therefore appear to the said Court or Sheriff that the profits of the undertakers for the preceding year have exceeded the prescribed rate, and that the sum of money in the said reserve-fund has been and then remains invested as aforesaid, and in case dividends to the amount hereinafter limited have been paid, make such a rateable reduction in the rate for gas to be furnished by them as in the judgment of the said Court or Sheriff shall be proper, (regard being had to the amount of profit before received) a profit as near as may be to the prescribed rate." That was to say, that if the Court made any order to reduce the price of gas, it should not reduce it beyond such a limit as would, so far as that Court could order, prevent the company from paying the maximum dividends which by law the shareholders were entitled to. It was contended that upon the true construction of the section, and upon the finding of the accounts by the officer appointed by the Court, the Court had no jurisdiction to entertain the question at all, because there were two conditions precedent to the Court having jurisdiction to make such an order, and those conditions were, that upon those two conditions being fulfilled, if one or both remained unfulfilled the Court had no jurisdiction. He had had considerable difficulty in bringing himself to view this section in the light in which both of his learned friends viewed it, but upon better and more mature consideration he had changed the view, and he said that the Court had jurisdiction. Russell. Parliament had placed an obligation upon the Stretford Gas Company—in case they had power to do it—to found a reserve-fund. If they willfully, negligently, or in any other way omitted to do that which the Act of Parliament imposed upon them as a duty, then in the construction of the Act, the Company was liable to be punished. He had to have done that which Parliament said they ought to do, although it was a fact that they had not established a reserve-fund to the extent of one-tenth of their capital. They had had the power to do so, but had diverted the money which ought to have gone to the fund, and used it for their own private purposes. When the question of jurisdiction was put to the officer appointed by the Court, and had also been examined by a gentleman on behalf of the Company, and from the evidence it might be taken that somewhere about £4000 remained in the hands of the Company. The question, therefore, now was whether the Company had had in their possession any money amounting to £4000, and whether the evidence of the officer of the Court—and his evidence was corroborated by a witness called on the part of the Company—it appeared that they not only had had £6000 in their possession, but more than that sum. The Company's own officer had given evidence showing that they had had

the means of complying with the Act of Parliament, and no reason had been offered as to why they had not done so. The accounts had been fully gone into, and the report presented upon them was very voluminous. This report showed that addition to paying the maximum dividends which the shareholders were by law entitled to receive, the Company had appropriated the sum of £17,109 6s. 6d. If this was true, and the Company had £4000 invested, they had paid themselves £11,109 6s. 6d., which ought to have gone to a reduction in the price of gas, and which was money illegally taken from the pockets of the consumers and put into the pockets of the Shareholders of the Company. It was wholly immaterial whether the sum was £17,000, as reported to the Court by its own officer, or whether it was put down at £3000, which was the sum given by a witness called on behalf of the Company, because the same result arose, except that the sum which the Shareholders of the Company had divided among themselves, and put into their own pockets, was reduced to £3000. The Court had, under the circumstances, come to the conclusion that there ought to be a reduction in the price of gas; they had also come to the conclusion that in case the Company should have a desire to add to the reduction, they should give every facility for the purpose. An order that the price of gas should be reduced to 5s. 2d. per 1000 cubic feet would therefore be made.

Mr. TAYLOR said he should like to call the attention of the Court to the fact that there was no provision in the special Act for an appeal, and that there could be no case stated unless express power were given for it.

The CHAIRMAN observed that he was the only member present of the Court who heard the matter, and as they had considered the matter beforehand, he could not do anything which would prevent the Company from appealing if they chose to do so. There was also, he said, another reason why the Court were desirous of giving every facility for reviewing the decision, and that was the fact that the Company had put into their pockets the large sum of money which was mentioned in Mr. Aldred's report. It might very well be, although the Court had not the power to order it to be done, that there was a Court which had the power to compel the Company to refund the same.

Mr. TAYLOR said he had only mentioned the matter in order that it might not be said hereafter that he did not call the attention of the Court to the subject. Moreover, the Company, in conducting these proceedings, were supported by the gas-rates—in reality their expenses with regard to the petition came out of the pockets of the gas consumers. There were, in fact, actually in the pockets of the consumers, and they were on an expensive litigation against the consumers, while the petitioners had to pay their own costs and those of the Company as well. He had, however, to ask for costs for the petitioners.

The CHAIRMAN: If you ask for costs they will be granted.

Mr. NASH: Not without hearing me, I hope.

The CHAIRMAN: No.

Mr. NASH contended that the Court had no power whatever to grant any costs beyond the costs of, and the remuneration to be given to Mr. Aldred, the Accountant. Where costs were granted it could only be by some express provision in the statute, and there was none in the 35th section.

Mr. TAYLOR said his friend was altogether in error, for the 35th and 36th sections provided that the nomination and appointment of the Accountant should be at the expense of the undertakers. Then there was subsequently to the Court an examination of witnesses. If the petitioners had been wrong there was express power given in the 36th section to make them pay costs.

The CHAIRMAN: You ask for costs whatever may be the consequences?

Mr. TAYLOR: Yes, and we will take the consequences.

The CHAIRMAN: And you say, Mr. Aldred, that in coming to the conclusion to give facilities for reviewing our decision, we were led by this consideration—that, as far as I know, this is the first case ever heard under the Act in this country.

Mr. TAYLOR: It is the only case under the Act reported anywhere.

The CHAIRMAN: There is another point Mr. Nash which I should like to mention. I cannot conceive that the Company will go on with the case, for there is another section in the Act of Parliament which applies to them, to which I direct your attention—that is the provision for the filing of accounts.

Mr. TAYLOR then asked that the costs should be taxed at Preston.

The CHAIRMAN: We will make an order that the costs shall be taxed at Preston. It was agreed that the judgment of the Court was to be delivered to-day, and in the absence of a member of the Court; and that no objection whatever should be taken to the decision on this account. Saying that the Court in its decision was of the opinion that the Company, in presenting another petition, and then judgment will be delivered rightly. We make an order for the costs to be taxed at Preston.

Mr. TAYLOR: It was agreed that the costs should be taxed at Preston, but now they say that they will not consent, and that we may do our worst.

The CHAIRMAN: If the Company are so badly advised as to say they will do their worst, probably you (Mr. Taylor) may show them a plan of doing your worst, which may cause them to change their minds.

Later on in the afternoon Mr. Nash, who had gone out of court before Mr. Taylor made his statements, and the result of what he said of the costs, said that Mr. Taylor was under a misapprehension in the matter, and that the Company would probably pay the costs in a generous and open-handed manner.

LAMBETH POLICE COURT—Friday, Oct. 29.

(Before Mr. HOSACK.)

ANOTHER OPONENT OF THE CONSTANT SUPPLY SYSTEM.

William Snell, of Falmouth Road, Kent Road, a member of the Vestry of St. Mary's, Newington, and owner of house property in the district, appeared to a Bench of Police Magistrates, and was charged with being guilty for neglecting to comply with the regulations with regard to a constant supply of water to houses of which he is owner, in Ingoldthorpe Grove, Glengall Road.

Mr. BESLEY appeared in support of the summons, and said the defendant had been guilty of a breach of the regulations made in order to allow of householders receiving a pure and constant supply of water. This was more particularly desirable in thickly populated neighbourhoods. The Lambeth Water Company had used every endeavour to bring about, by means, this beneficial system, and the result of what had already been done was highly satisfactory. In order to effectually carry out the system of constant supply, it was necessary that owners of property should provide proper cisterns, fittings, &c., and in this respect the defendant had failed, notwithstanding proper notice was given to him. The defendant was a Vestryman of St. Mary's, Newington, and as such it was thought that he should set a good example. In the section of the Company's district in which the defendant's property was situated, the owners of 7000 houses had notice in September, 1879, to put their fittings in such a state as to allow of a constant supply of water being furnished. Sixty days notice was given to do the work, and the defendant had not done so on for the constant supply, when it was found that some 2000 houses were without water, thus causing a large amount of waste. Several cases of this

kind had been decided against parties in this court, after which some 1600 houses were put under proper regulations, and there remained only about 400 houses, the owners of which had not complied with the regulations. The defendant had been summoned to be summoned particularly in his position as a Vestryman should have induced him to obey the law. Owing to the defective state of the fittings of the defendant's houses, there had been a money loss to the Company of about £25, and he might add that if the tenants complained the defendant turned them out. Owing to the defendant's delay in doing the work, about 1000 gallons of water were wasted daily. After proceeding to point out the section of the Metropolitan Water Act bearing upon the question, he asked that a penalty should be imposed to teach the defendant and the owners of property of a like description that they were bound to obey the law, and not go on in this way.

Mr. H. J. Catmur, head Waste Inspector to the Company, having given evidence,

Mr. HOSACK said he would grant the defendant 14 days grace, but warned him that if he did not by that time do the requisite work, the penalties which were not very light, would be imposed.

Upon the application of Mr. Besley, his Worship allowed at present £1 is. costs.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

THE SUGGESTED "STANDARD OF QUALITY," AND THE CONTAMINATION OF WATER IN CISTERNS.

In his last published report Lieut.-Col. Frank Bolton, the Official Water Examiner, has the following on the above-named subjects:—

"It is suggested that the question of a practical standard of quality should be considered and determined by the highest authorities connected with the medical and chemical professions, and with whom such standard adopted by the Authorities it will then become the duty of Engineers connected with the Water Companies to work up to such standard, and the supply of water to the Metropolis would be regulated thereby. Thus the purely arbitrary terms, such as 'clear,' 'slightly turbid,' 'turbid,' and 'very turbid,' now used to describe the quality of water, would no longer be employed. These terms are objectionable, because that which one Examiner may consider 'very turbid,' another may deem only 'slightly turbid,' and vice versa.

"Much of the water delivered for domestic purposes is constantly deteriorated by the action of the Companies' mains, in the dirty state of the cisterns on the premises of the consumers. Many of the cisterns, tanks, and butts for containing water, especially in small tenement-houses in the Metropolis, are in a disgusting and filthy state. All cisterns should be properly covered and be frequently cleaned out, and every care should be taken to prevent the water from coming in contact with domestic supply after delivery. Now, as heretofore, it appears to be the rule, in building a certain class of houses, to place the cistern over the water-closet, with an untrapped waste-pipe communicating with the drains. These cisterns are often left open, and regularly receive the drippings from the roofs and gables. They are, moreover, in close proximity to the dust-bins and other deposits of filth and garbage.

"The remedy for this state of affairs will be found in the establishment of the constant supply system, and the consequent total abolition of these unfit receptacles. Meanwhile, and until the system of constant supply is completed, the owners and occupiers of houses are wrong in permitting such a condition of things to exist. In the better class of houses and in many public buildings the cleansing of cisterns and tanks is frequently neglected for months, and, in some cases, years are permitted to pass without any examination or cleansing taking place.

"The present state of affairs in the case of the cisterns are already giving constant supply by means of stand-pipes, provided, in most cases, with self-closing taps, and in the districts of those Companies which are extending the constant supply, a marked improvement has taken place in the quality of the water consumed by the small householder, which thus reaches the house in the same condition as it leaves the Company's mains.

"In these monthly reports attention is periodically drawn to the necessity which exists for the regular cleansing of cisterns, and also to the fact that the contamination of water from the gases generated by sewage in or near the drains is a frequent cause of complaint. In the better class of houses, from cisterns are still to be found in direct communication with the sewers, and the gases thus flow back into the cisterns and become absorbed by the water. To prevent this the overflow-pipe should be brought outside the house, and the end left exposed to the air, instead of being carried into the drain, as is often the case. If the adoption of this plan the poisonous effluvia and gases from the drains will be got rid of. These would otherwise ascend through the pipe, and not only be partly absorbed by the water in the cistern, but be mixed with the air in the houses, thereby becoming a cause of danger and disease."

THE LECTURES DELIVERED DURING THE GLASGOW GAS APPARATUS EXHIBITION.

During the continuance of the exhibition of gas apparatus, &c., recently held in Glasgow, the Committee of the Philosophical Society arranged for a series of lectures to be delivered on subjects of interest in connection with the display.

The first lecture was given on Friday, the 8th ult., when Mr. A. VERNON HARCOURT, M.A., F.R.S., Reader in Chemistry at Christ Church, Oxford, dealt with

DOMESTIC GAS LIGHTING.

The lecturer said that on this was the first of a series of lectures relating to the uses of coal gas and its by-products, which should begin with a brief description of the manufacture of gas, illustrating his description by the aid of the model of a gas-works exhibited by Messrs. Laidlaw, Sons, and Coine.

Having followed the gas up to its distribution to private houses, he gave a description of the two forms of meter employed to register the amount of gas consumed. A beautiful specimen of a dry meter enclosed in a glass case, exhibited by Dr. G. Glover, was in operation upon the table. The lecturer explained the action of the valves by which the gas was admitted at a higher pressure to the meter, and was admitted alternately to a chamber on each side of the partition, and to every chamber in rotation. The volume of gas which passed through the meter during each movement of each diaphragm could be reckoned by multiplying the area of the diaphragm into the length of the stroke. For example, if the area of each diaphragm was 1 square foot, and the movement was 3 inches to and fro, a complete series of the four successive movements would be due to, and

would indicate, the passage of just 1 cubic foot of gas. The plate which formed the face of each diaphragm was supported by an arm attached to a vertical spindle, which was turned round through a small angle by each movement of the diaphragm, communicating its motion both to the slide-valves and also to a train of wheelwork, by which a record was kept of the number of the movements, thus showing the volume of gas passed through the meter.

The action of the wet meter was illustrated by some of these instruments with glass front and back, by a drum revolving in a glass water-tank, and a dissected drum provided by Mr. Foulis. It was pointed out that, as in the case of the dry meter, equal measures of gas entered each of four compartments in succession. Each compartment half overlapped its neighbours, and had two openings on opposite sides of the drum and on the same diameter. To one side of the drum a concave plate was attached, having a small central opening. The drum being more than half submerged in water, this opening was sealed, but a pipe which passed through it and turned upwards allowed gas to enter, and the other being into the compartment. The pressure of the gas against the side of the compartment which it entered being greater than that of the gas in the adjoining compartment from which gas was expelled, caused the drum to rotate. As the drum rotated another inlet rose above the water, the compartment filled, the gas sending the drum till the diameter on which the openings lay was nearly horizontal, then both openings were sealed, and immediately afterwards the opening on the opposite side rose above the water, and through it the gas was expelled as the compartment was again lowered. At each rotation the meter transmitted the volume of gas equal to the capacity of that portion of the drum which was above the surface of the water. Thus the measurement depended upon the level of the water. Various methods had been devised for keeping this level constant, to some of which the lecturer referred. A most ingenious method was being exhibited—an invention of Mr. Warner's—by which an inner drum returned a portion of the gas from the outlet to the inlet, this portion increasing or diminishing with the change of water level, by the same amount by which the capacity of the principal wheel was increased or diminished.

The general action of a meter might perhaps be illustrated, Mr. Harcourt said, by comparing it to the turnstile by which visitors were admitted to the building, and which kept a record of the number who passed. Each compartment in turn was filled from one side and emptied on the other, no passage being possible without moving the turnstile round. All could see, and all understood, that since once the passage of gas could make the meter move, the meter would be set to prevent the water rising above its proper level, the measurement of gas consumed was as little liable to error as the measurement or weighing of any article of domestic consumption. The mode of reading a meter was explained, and also the use of the cylinder which marked the passage of small quantities of gas, for observing consumption during a short period or for testing leakage.

From the meter gas should, the lecturer stated, pass to a governor for regulating its pressure. The construction of wet and dry governors for household use was explained by coloured diagrams. In both, any increase of tension at the outlet of the governor partially closed a valve, which the gas entered, and vice versa. By a simple adjustment of weights the pressure was fixed at any desired amount, not exceeding the minimum pressure at which gas reached the governor. Provided the system of service-pipes within a house was sufficient for the number of burners, and the burners were good, the governor might be set to prevent the pressure to 5-10ths or 6-10ths of an inch of water. Each burner might then be adjusted once for all by any mode of obstruction, so that when the tap was turned fully on it should let pass that volume of gas which was calculated to most advantage.

Instead of regulating the pressure throughout a house by a single governor, Mr. Harcourt continued, it was also possible to prevent the waste of gas which occurred when it was consumed at too high a pressure, by having a regulator attached to each burner. Several burners were shown, and Mr. W. Sugg, the lecturer's assistant, explained the principles of which they remained perfect when that of a burner without a regulator attached to the same pipe was destroyed by excessive pressure. Such regulators were of two kinds. In Mr. Sugg's governor-burner the construction was the same as that of dry governors on a large scale. A constant volume of gas, the amount which was to be regularly let pass, passed through an opening in the plate which formed the centre of the moveable diaphragm. An increased pressure beneath the diaphragm checked the inlet of gas. Thus the gas passed through an opening the size of which had been adjusted at a constant pressure; and its rate of flow was the same, in all circumstances, as that of other kinds. The rheometer was the original type, of which Mr. Peebles had made a governor and another form exhibited by Mr. Sugg appeared to be good modifications. In these regulators also a constant flow of gas was maintained by causing the gas to pass through a fixed orifice at a constant pressure, but the constant pressure was maintained, not by checking the access of gas to the inlet side of the small opening, but by checking its escape, and thus increasing the pressure on the outlet side. The relation between the two might be thus stated: In both the gas flowed through a small opening from chamber A to chamber B. In the first type of regulator the gas which entered the chamber B was not checked, but was allowed to flow into it, in the second by checking the outflow.

In respect of steadiness of flame, which Mr. Harcourt said, was a matter of great importance, because unsteadiness constituted the chief objection which many people had to the use of gas, he remarked that many forms of burner had been devised, but the one so defectively constructed that it was impossible for the flame to remain steadily burning. Oil globes or shades even increased the natural unsteadiness of the flame caused by the currents of air in the room. That was owing to the lower orifice of the globe being smaller than the width of the flame, in consequence of which the currents of air passing through the narrow opening at the edges of the flame, and caused them to flutter. If, however, a globe with a wide orifice below—not less than 3½ or 4 inches in diameter—was used, the whole of the flame was in the current of air, while at the same time it was protected from the general movement of the atmosphere. These statements were illustrated by a couple of globes—the one being the other properly constructed. Speaking of ground and opal globes, the lecturer said it was a matter of opinion whether they improved the appearance of gaslight, but before deciding to adopt one or other of them, the consumer should recollect, in regard to ground globes, that he sacrificed 10 per cent. of the illuminating power of gas, and in the case of opal globes no less than 60 per cent.

From this point the lecturer proceeded to discuss some of the dangers likely to result from the use of gas. One danger was the inhalation of noxious fumes, and the other the risk of explosion. In reference to the first Mr. Harcourt said the danger of inhaling noxious gas was subjected at the place of manufacture should be sufficient to remove it all the sulphur which gave gas its injurious property. Most works were provided with apparatus for testing the purity of the gas, and if the apparatus were properly attended to no impure gas could be supplied. It so happened, however, that sometimes impure gas was furnished to con-

sumers—impure in the sense of containing more than 6 or 7 grains of sulphur in 100 cubic feet of gas. Gas containing less sulphur than this amount was practically quite pure, and was, at all events, innocuous. The lecturer next proceeded to show by experiment how the presence of sulphur in gas could be detected. Dipping a piece of paper in a solution of acetate of lead, he held it over a tube containing pumice-stone coated with platinum, through which a current of gas was passed. In a cubic seconds a dark stain was produced upon the paper, thus showing the presence of sulphur. He said, however, that this was a delicate test, and that it showed the Glasgow gas to be exceptionally pure. At Oxford, from which city he came, the paper would, in similar circumstances, be almost immediately covered with a very dark stain. With regard to the risk of explosion, the lecturer said that this might happen through the gas being turned on again in the act of turning it off, or from the absence of water in the tube of a gaselier, or through some leakage in the pipes caused by corrosion, or by a nail being driven through a pipe, or by injuries done by blasting, and so on, and that such causes would be soon discovered, and, of course, it was the duty of the consumer to ascertain, if possible, where the escape came from. He was not now speaking of such escapes of gas as sometimes caused a slight smell of gas in a house, and he did not think any one would trouble himself about such escapes for it did not exceed one-sixth of a cubic foot per hour there was no risk of explosion, and he did not think it had ever been shown that such an escape was injurious to health. He was referring to those larger escapes which could not go on long in a house without causing considerable inconvenience. Of course, the best way of avoiding the risk of finding an escape of gas was by applying light along the pipes, and generally such operation could be conducted without danger. Of course the gas engineer or householder who, experiencing a strong smell of gas, immediately took a naked light and endeavoured to find its origin, would be, to say the least, a rash man. Being lighter than air, it always rose to the ceiling, and if the light was high up, the air, the windows and doors should be thrown open in order to effect a clearance of any gas that might have accumulated. When this had been done there was no risk whatever in applying a naked light to the pipes, because there was no danger in a jet of gas itself, but only in the possibility of sufficient gas having escaped to form an explosive mixture with the atmosphere of the room. In order to illustrate the nature of a gas explosion, the lecturer showed a very interesting experiment. He inverted a glass jar over a burner. The jar, instead of having a closed bottom, was continued in a tube, which, at the corner of the cess, was inserted into a hole in the ceiling. The jar, after being turned on, the gas in the jar, so formed with it an explosive mixture, and on applying a light to the end of the tube an explosion occurred. The flame rushed downwards, of course without doing any harm, but with sufficient force to show the nature of an explosion.

On Tuesday, the 19th ult., the second of the series of lectures was delivered by Mr. GERVILLE WILLIAMS, F.R.S., his subject being—

THE HISTORY OF COAL-TAR COLOURS.

As Mr. Williams's highly interesting and instructive lecture* before the British Association of Gas Managers, in June last, has been so recently published in these columns, there is little that need be said of the Glasgow one, but it was so full of every new and novel discovery, and was well received by a large audience. After tracing the development of the coal-tar colour industry to its present stage of development, and prophesying a great future for it, Mr. Williams concluded by saying that in ancient times the purple, which it was death to all below Imperial rank to wear, was only the juice of a poor shell-fish, and that it had been reserved for modern chemical science to show that every colour in the loveliest opal might be extracted from the foul and offensive refuse of gas-works; and queens and princesses owed their most brilliant adornments to the products derived from so lowly a source.

[The third lecture was one with which we have no special concern. It was delivered on Friday, the 15th ult., by Professor G. Chrystal, of Edinburgh, who discoursed on "The Electrical Transmission of Sound."]

On the 19th ult. Dr. STEVENSON MACADAM, of Edinburgh, delivered the fourth of the lectures, on—

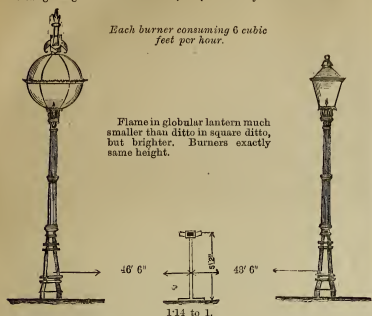
THE ILLUMINATION OF LIGHTHOUSES.

The subject of this lecture was, Dr. Macadam said, a matter which possessed for him considerable personal interest, and at the same time was of a great national importance. He alluded to the age common to the subject, and to the fact that the only representative of the lighthouse, and in their primitive condition the wonder was that lighthouses could be any guide to mariners going from port to port. There were records of important lighthouses at Alexandria, Boulogne, and Dover, and these were undoubtedly simply wood or coal fires. A century ago the question of the use of oil was hardly considered. When the first Eddystone lighthouse was erected, the only things used there were a tallow candle or two, and even when Smeaton erected the last lighthouse on the rock a number of tallow candles were employed. The use of the candles was continued till the beginning of the present century, when oil did good service instead; and in carrying out improvements in lighthouses, there was no doubt, as far as regarded Britain, that the Eddystone Lighthouse, as constructed by Smeaton, was the first representative of what might be called the modern system of lighthouse illumination. Of course, the lamps used in lighthouses had not greatly improved, but the introduction of brilliant lights, such as the gas, had been made; but the introduction of mineral oils formed a very important epoch in the history of lighthouse illumination. The oil used was specially made for the purpose, and was what was generally called lighthouse oil, being of that degree of safety, and, under the circumstances, of that purity, that it would light a house, it was practically non-explosive. Captain Doty's lamp—a paraffin one—was first used in a French lighthouse in 1868, and the late Emperor was so pleased with it that he ordered paraffin lamps to be used in all the smaller lights. After this order had been given, Captain Doty came to the attention of his Majesty's Government, and had been recommended by the Commissioners, and its introduction was ordered into one of the lighthouses, the Commissioners at the same time requesting that experiments should be made in regard to its efficiency, and as to how far paraffin oil could be used. It was found that double the lighting power was obtained from the oil than from the candles, and that it had been used in the same way, and that at one-half the expense, so far as the purchase of the oil was concerned.

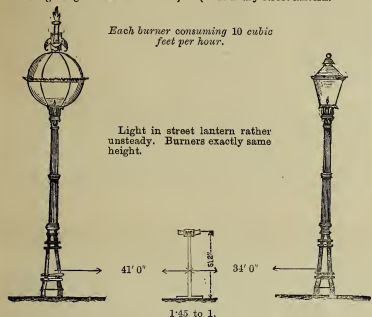
Dr. Macadam went on to refer to the different kinds of lights used in lighthouses, and to the experiments to be made in the exhibition, constructed by Mr. Peebles, to bring out an idea of Sir W. Thomson's that every lighthouse should flash its own name; but said, with all due deference to so eminent a physicist as Sir W. Thomson, he (Dr. Macadam) was inclined to believe that the more simple method of registering a lighthouse's name either by having two lights, the one above the other, or by flashing at

* Lecture on "The Past, Present, and Future of Coal Tar," see JOURNAL Vol. XXV., p. 6.

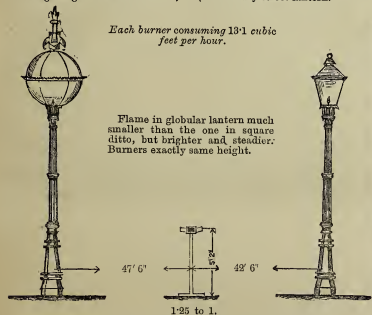
(No. 1.)
Bray's Flat-Flame Burner in } v. { Bray's Flat-Flame Burner in
clear glass globular lantern. } ordinary street lantern.



(No. 2.)
Bray's Flat-Flame Burner in } v. { Bray's Flat-Flame Burner in
clear glass globular lantern. } ordinary street lantern.



(No. 3.)
Bray's Flat-Flame Burner in } v. { Bray's Flat-Flame Burner in
clear glass globular lantern. } ordinary street lantern.



Mr. W. T. Tew (Warwick) asked if Mr. Hunt had any other theory to account for the results.
Mr. HUNT: No; unless the rays of light were better directed to the angle of vision by the circular lantern. Passing through a square lantern they take a direction at right angles to the glass, and so they do in the circular lantern; but, as a matter of course, they are thrown in all directions by the latter, whereas in the square lantern they are thrown more in one direction, and that direction above the angle of vision.

Mr. T. COLLETT (Dudley): The circular lantern throws the rays more to the ground.

Mr. HUNT: The circular lantern appears to throw the light more where it is wanted.

Mr. J. S. CRAMMER (Stratford-on-Avon): Were the experiments with lanterns having opal glass on the top, or plain?

Mr. HUNT: Perfectly plain.

Mr. CRAMMER: Have you made any experiments with the opal glass?

Mr. HUNT: Experiments with opal were reported at the last meeting, and some doubt was expressed that the experiments were not all on equal terms.

Mr. G. E. STEVENSON (Peterborough): I noticed in circular lanterns in London a great deal of reflection at the side. One could see the flame reflected from different points, and this would perhaps add to the light going in any one direction.
Mr. HUNT: That would affect the lantern all round. If light is reflected, it is prevented going in a certain direction.

The discussion then terminated.

[The subsequent proceedings included the reading of two papers by Mr. G. E. Stevenson and Mr. H. Woodall—on "The Manufacture of Sulphate of Ammonia," "Meter-Rents," respectively. The revision of the remarks made by the various speakers in the discussions that followed, not having yet been completed, we are compelled to hold over till next week the remainder of the report of the meeting.]

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.
On the conclusion of the President's address, published last week,
Mr. D. C. NIVEN (Dunoon) read the following paper on

LEAKAGE.

I had the idea of considering the flow of Scotch gas at varying pressures, in pipes of different lengths and capacities; but the subject has so grown upon me that I do not feel myself prepared to treat it until I have further verified my data. The ground is, so far, untrod by any Scotch manager, and a considerable amount of work is implied in the calculation of tables for daily reference.

As preliminary, I wish, on the present occasion, to make a few remarks on leakage. By it I mean the difference between the total quantity of gas made, as per station-meter, and what has been sold, used at works, and given as gratuities. The station-meter is thus the basis for leakage, and, consequently, a most important instrument. It has, however, no water-line tube, which may become an overflow into a waste-box. It has no float-valve that would determine a certain range of percentage fast and slow. It has, indeed, a glass gauge to show the line of water, and if the water exceed that line, there is, or should be, a siphon overflow; but if it does not, there is, at least in many meters, no automatic adjustment. Wherefore, if the meter has too much water, the registration of production will be at the expense of leakage; if too little water, the leakage will be at the expense of production. Again, if the temperature of the gas in passing through the meter be, say, 65° Fahr., and the gas on an average at the consumers' meters, say, 50° Fahr., there is a difference of volume of about 3 per cent.; but such a range of temperature would also cause a dilatation, through saturation of aqueous vapour, of about 1 per cent. To determine this point, a thermometer should be attached to every station-meter, not only as a means of reducing the registration daily to the standard volume, through Mr. Hartley's tables, but also as enabling an occasional comparison to be made of the average temperature of the gas, as supplied to consumers. Once more, coals vary in their hygrometric power, and accordingly the gases from some coals have a comparatively high percentage of aqueous vapour floating along with them; and this is independent of the saturation of a gas arising from temperature. Now it is obvious that if the holders or pipes be colder than the meter, then so much of this aqueous vapour in the gas will condense, and tend to fill the holders, drips, or siphons. We cannot in this case decide the percentage of loss unless the gas was analyzed immediately after leaving the meter, and then again at some distance from the works.

I sometimes read of a flattering cry about percentage of leakage; but that the phrase may have a meaning other than misleading, a few points must be considered. If I, for instance, have a loss now of 20 per cent., while the annual make is 10 millions, and the number of miles of pipeage, say, 1, then there are 2 million feet of gas passing out of the joints of mains, excluding in the meantime services and meters, or 13½ feet per hour in the mile; that is to say, 3 perforations each equal to about a No. 3 Bray's burner per hour in every mile of main-pipe. Now, if the production were doubled, the increased demand would act as a kind of exhaust in the pipes, and as the gaseous molecules would have a greater velocity, then shorter delay about these perforations would probably diminish the escapes. At all events, I cannot see that an increased production could so affect the perforations as to enlarge them. It would follow, then, that the main-pipe being in the same kind of condition, the leakage would be reduced to half of the former percentage. The manager, in this case, would most probably be called a clever fellow, while actually he had done nothing to deserve it. Now, so that justice may be done either to a former condition of the same works or in the comparison of one works with another, there must be a consideration of the doctrine of probability, by embracing all the possible occasions for waste, and that is not only every joint, but the kind of soil and the traffic upon it, as well as the annual make, and the distance from the works of the principal consumers. But if these elements are embraced in a proper judgment on leakage, then the ratio of loss to make, or the phrase "percentage," conveys no information as to the facts of the matter, and, in reality, becomes a delusion and a snare.

It has been held that in consequence of the osmotic force of gases a considerable leakage is the result. It is true that the fact of gaseous diffusion is clearly shown by respiration, ventilation, and the dilution of poisonous gases. It is no less shown by the wonderful uniform mixture of the atmosphere, as well as by that of coal gas. It has been proved that plaster of Paris, stucco, caoutchouc, and pressed plumbago give little obstruction to diffusion. It has been discovered that this osmotic force decreases as gaseous density increases, so that it acts not in mass but by molecules. Now, Professor Maxwell, in his work on "Heat," states that hydrogen and carbonic oxide can be made to pass through iron; and Dr. Frankland says that "the quality of hydrogen which is most important to us is its great diffusibility through porous substances, and more particularly through gas-pipes." But hydrogen forms from 30 to 50 per cent. of the volume of coal gas; therefore the exosmotic law upon the molecules of hydrogen will decrease the gaseous volume, and thereby correspondingly increase the percentage of leakage. At the present day, however, most of the pipes of any size are cast vertically, which tends not only to the security of thickness, but also to avoid the density, and probably the leakage by exosmosis in gas-pipes is inconceivable. Mr. George Anderson says that he laid 700 yards of 14-inch main, and it stood under a 6-inch pressure, there being no escape. Mr. W. J. Warner, of South Shields, has also said that he laid 900 yards of 18-inch main, and it stood 24 hours under a 6-inch pressure, without the least indication of loss. Are these testimonies based upon their own personal experience, or are they the reports of some of their workmen? Seeing, therefore, that these experiments contradict scientific authorities, their conditions would

require to be known before being admitted into the region of fact. I freely state that Mr. Anderson and Mr. Warner are authorities in the gas world, but must be pardoned if I take to *avoids* the question of whether such experimental facts have scientific significance.

There is a difference of opinion about the ratio of loss from the mains. Some hold that the principal loss is from the services; others, from the meters. As for myself, I say that the world's loss was from the mains, and during the past five years I reduced the leakage 13 per cent. The joints were either badly set up or deficient in lead, and the pipes not firmly bedded. The services were carelessly connected, and not a few of the joints, and only a couple of threads in the junction of the pipes. Now, in regard to a town having a heavy leakage account, what is the best mode of procedure in reducing it? One element must always be considered in giving the answer, and that is the least present expenditure, for doubtless directors are exceedingly loth to spend money on that which they may not much affect the profits. I consequently adopted a suitable day pipe, or night pressure, or a walker, slow, over the whole length of main piping, and took notes of escapes; then, in surveying the meters of the consumers, I took special note of their line of services, and by this means I discovered the principal escapes, and repaired them *seriatim*. Afterwards I pierced over every joint of a section of any suspicious main, and by this means found out a few more lead joints. I then, in the case of some of the principal mains, cut them in two places, 220 yards apart, stopped the ends, affixed a test meter, and thus localized a few more escapes. In some cases, where the soil was open and porous, I had to strip the joints, as I was misled by the gas test. In some cases, where the night pressure was low, I had to dig up the whole length of main piping, and reaching a spot 50 yards from the place of exit in the main. While I consider, for all practical purposes, the foregoing mode of reducing leakage as being the cheapest, still the one most satisfactory and complete is that which divides the main pipes into sections, and tests each section by means of a portable holder and test meter examines sectional pipes of, say, 220 yards, or one-eighth of a mile, in length, and then repairs them in the usual manner. I should, however, be opposed to cutting main-pipes for that purpose if they exceeded 6 inches in diameter, for bladders instead of air could be used, and the holder, as an oblique test, of a large size of holder would be 2 feet in diameter by 2 feet in depth, and, roughly speaking, having 6 feet capacity, and therefore could be arranged for 5 feet as testing with, say, 4 inches pressure, which would perhaps give a half more delivery per hour than the usual night pressure. The principal advantage of such a method is that the very greatest loss in the main pipe is tested, and thus enable the escapes to be more easily discerned; but there would also be a great saving of gas, as the day pressure only would be on the rest of the mains not under examination. The next step I took was the gradual repair or destruction of the oldest meters, until they can now all appear at the work, and do it in a better manner.

There is a difference of opinion as to the merit of turned and bored joints. Two kinds of turned and bored joints require notice. The one has the spigot turned, which corresponds to the whole-bored socket; the other has the spigot only half turned and a recess left for lead. In regard to the former, my experience is that they are a source of serious loss, as well as of annoyance, and that the best mode of dealing with them is to cut off the turned spigot, and make lead joints. But this experience must be in concurrence with that of others, else the other kind of joint—the turned and bored—would not have been invented. In regard to this latter kind, I have no experience, but I would reason thus: Either the somewhat conical spigot is turned to correspond with the bored socket in a straight line, or at a particular angle of that line, and if such pipes be laid in deviation more or less from either, then there is more or less a liability to leakage. But gas-pipes are laid more or less in deviation from either a straight line or a particular angle of that line; therefore gas-pipes of bored and turned joints are liable to leakage, and, of course the reply is that this was foreseen, and hence the cavity for lead. But I would answer thus: Presuming that the turned and bored pipes are leaky, and the lead is used in the recess, is this a makeshift or a cure? It cannot be a cure, for their own argument, which is an *argumentum ad hominem*, is that different metals are used, and different temperatures, therefore the lead and iron being not uniformly affected are liable to leak. It follows then, as a corollary, that the leakage by means of lead cannot be properly cured. It is thus a makeshift, and this is the opinion, based upon experience, of not a few eminent gas engineers, who would gladly give up all lead joints, and convert all mains and services into pipes set against lead joints? No; for those who advocate lead joints think there is more merit in the yarn than in the lead, and that the lead may be compared to the cap of a stuffing-box. Again, the turned and bored pipes fall where there is any subsidence of soil, as in mining districts, soft peaty soil, or vibrating ground from heavy traffic. They may perhaps pass if laid on solid ground or rock, in a straight line, and where no traffic of any consequence takes place. I hold, then, that they should be almost, if not altogether, discarded from gas-pipe laying. They may, however, be effective, and I think so in regard to water, for the drops of water are not to be compared to the molecules of gas, nor do the conditions of the laying of the pipes require to be the same.

In reference to lead joints, it is argued that as different metals are not uniformly affected by temperature in their expansibility, so lead joints cannot be trusted. But, besides containing a misconception of the lead joint, it is an argumentum ad hominem, and does not follow. The temperature in this country affects our pipes to such an extent even at their minimum depth of, say, 18 inches. It is also argued that the experience of not a few managers is that lead joints are unsound, and cannot be trusted. I could produce contrary testimony of the converse; but such a mode of reasoning is not a sound one, and I have no objection to making the propositions. As for myself, I have lifted about half a mile of 4-inch piping that had been upwards of 20 years in the ground, and every joint was gas-tight. These joints had been made with tar-yarn and lead. The question here arises, is there anything in the inherent nature of a yarn and lead joint that renders it liable to become unsound? I cannot see from what point of view would merely give rise to what is called the fallacy of accident. Hear what a practical man of some years experience says upon it. I refer to Mr. Whimster, of Perth, who, in a paper on "Main and Service Pipes," read before gas managers at Perth in 1865, says: "The spigot end of the pipe is placed in the socket, and the joint is made, and the annular space between is filled to about half its depth—say 2 inches—with tarred gasket caulked firmly in. The outer half is filled with soft lead and caulked until it is perfectly gas-tight. This joint, when well made, and at a sufficient depth in the ground to be safe from disturbance, is all that is required to be done. The gas manager here expressed about the soundness of lead joints is firm and clear, but the description of how to make such joints is most disappointing. He takes the trouble to explain what is a main-pipe, which everybody knows, but in regard to such an important matter as the making of a good lead joint there is no recommendation. It is not a good lead joint, is it a good lead joint? The spigot must be uniform in the socket; the yarn must be the best spun hemp, tarred or untarred, and well caulked, say to a half or two-thirds full of the socket; the lead must be soft, and free from tin and

zinc, and there must be sufficient of it in the ladle to make a full joint at one running, otherwise there would be rings of lead; the clay bell or joint clasp should be so made that after the lead is run in there is a projection or head of 4-inch of lead over the face of the socket; and in caulked, a chisel and three sets of staving tools will complete the joint, which for finish and soundness is not to be surpassed. Relative to the attaching of services to mains there should be no chimneys or gouging of holes; they should be drilled, rymered, and tapped. The wrought-iron pipes should have their couplings taken off and white leaded, and the ends of the lengths of piping should meet when the coupling has made a proper junction. In every case of a long thread there should be two hempen washers and two back washers.

A grave mistake is sometimes made by connecting a 4-inch service-pipe with a 2-inch main. In some cases I have found at the junction in the pipe a crack which incurred a serious loss. It is plain that a 1-inch hole on the surface of a 2-inch pipe is relatively far too large, independent of the idea of the risk of fracture. I am much surprised at Mr. Whimster advocating 4-inch lead services, putting forth even the idea of comparison with 4-inch cast-iron and wrought-iron pipes. Why, 4-inch cast-iron pipes are only about 4½ feet in length, which implies multiplicity of joints, and are so brittle that if let fall they will break like a pipe-shank. His experience shows and indicates that a heavy leakage account, instead of making a comparison as if it could in any way be commendable. Again, in looking over a price list issued from Glasgow, I observe that while 1-inch cast-iron pipe costs 11½d. per yard, 1½-inch is only 11d. The larger pipe is actually cheaper, and it is of far more use. My doctrine, based upon the facts of the case, is that services should be made of wrought-iron, not cast-iron, and that cast-iron should not be less than 1½-inch. The faucet of such a pipe will make a good joint with the piece of wrought iron required to complete the service to the soft pipe. While lead may, for aught I know, be trusted as a good service, still I am sure every one will admit that the use of cast-iron pipes is a waste of money, and a waste of ground, or even to be below the flooring in case of accidents, exclusive of the idea of waste. I am happy in being able on this point to quote Mr. Newbigging, who, in his "Gas Manager's Handbook," condemns 2-inch cast-iron pipes as mains, and 4-inch wrought-iron pipes as services, for they are slow and indirectly tend to a heavy leakage account. It may be argued, however, that wrought iron, by its non-durability, is a great source of loss; but this statement is only a phase of the question of characteristics of soil for pipes. Doubtless for the soil to be gravelly, sandy, or boggy, it is very deteriorating, and it is even worse if the bed of the pipes is of a soft nature, and the pipes are not allowed to be anchored into the ground. Under such circumstances the pipes would require to be coated with tar or pitch, and even bedded in earthy soil or clay. Malleable piping, if not coated with tar or pitch, is said to have its oxidation delayed by galvanizing its surface, or painting it with oxide of zinc.

I do not think much loss can be attributed to meters. At the present time their construction is almost perfect, and consequently the great range of percentage, fast or slow, belongs to meters of a bygone day. It is certainly necessary that there be a periodical inspection, not only to keep the meters right, in the case of fast meters, but also in the case of slow meters, so that they may be rectified without delay. It is found that dry meters under two lights cannot be trusted for correct registration. From this size, however, they do duty very well, and independent of their use at extremes of temperature, or for badly arranged internal fittings, they have been a good friend to the manager when the auditors have back-played the meter with the wet meter. Any meter makes a revolution of its dial between one survey and another, it should be changed at once as being too small.

I believe that public lamps have often been the source of considerable trouble, and they have also had the occasion of many a sad feeling. If the hours be not strictly attended to, and the same kinds of burners used as were agreed upon, the stopcocks not carefully shut off during the day, nor the leaks about their tubes promptly repaired, then the lamps tell a tale in the leakage account. If in the case of average meter indication the burners of the lamps are not allowed to be changed, and the same kind of lamps are used, or if there be an obstruction in the tube, it must not be touched; or if the meter registers slow, or not at all, it is not to be changed; and if there be not a regulator to every lamp, then I consider such a system, under whatever name, as a kind of humbug, for there are no charges to be made for the lamps to arrive at the meter, and the lamps are to be changed for such kind of work is carried on, perhaps the better way is to charge for each lamp with a specified burner having a regulator, and for so many hours in the season.

The last point to touch upon is that of pressure. It is admitted by all that high pressure is a great contributor to the leakage in our houses, and the advantage of governors at works, and also street governors in hilly districts. It is also important, for the equalizing of the pressure and circulation of the gas, that the pipes of cross streets should be connected with the principal mains. I can realize the enormous loss through maximum pressure during the day on at least the half of my piping, by supplying a holder some miles out of the town. We are now relieved of this incubus, and the loss from it will be determined by next year. The line of pipes being too small, I have occasionally found three miles from the works a couple of pailfuls of pure tar in one of the drips. I have always understood that this tar was just the lighting of a small candle by the use of high pressure in the pipes. From this fact one would almost infer that the quality of the gas was much inferior than when it left the works, but there was little difference in it. Might one, then, not rather infer that as the hydrocarbons had been deposited, the hydrogen and carbonic oxide had, to a considerable extent, been used up? This is a question that I do not propose to go far to explain a limited delivery, which was the fact. It is obvious that different towns vary in their day pressure according to circumstances of consumers and consumption, and hence one town cannot be a guide to another in that matter. The one in the night pressure may be through small pipes, and will get quantity and quality of the gas, be thereby seriously affected, and the remedy of laying larger pipes would soon recoup itself. If, on the other hand, the pressure be high through a greater supply than demand, then the one in charge requires to be taught the doctrine, and to realize it, and to be able to demand for gas in the course of the evening, so should the supply be regulated.

To recapitulate, in the treatment of the subject of leakage I have endeavored to point out its sources, preventions, and cures, and think the following propositions, as corollaries, highly probable—

1. That the present percentage of leakage in this country is not a fair average, and it is difficult to give a correct statement about actual waste of gas.
2. That it is difficult to compare one works with another regarding leakage, for, generally speaking, the circumstances of each are peculiar to itself.
3. That the gas managers generally are dependent more upon their good fortune than their faculties for a small leakage account.
4. The question may be raised, in conclusion, What is a reasonable amount of leakage? Mr. T. H. Methven held 12 feet per mile per hour reason-

able; but Mr. W. J. Warner, in a paper read before the British Association of Gas Managers in 1873 (see JOURNAL, Vol. XXII., p. 590) says that "the unaccounted-for gas may be reduced to so small a minimum as to be lost in condensation." It is understood that this startling assertion, let us try to discover its meaning. When, then, the condensation? Either Mr. Warner means greater density, and thus less volume; or the liquefying of the gas, and thus less volume. But greater density in gas-pipes can only arise from difference of temperature, or pressure, or small pipage, or together. Now, a small pipage may be enlarged, and while the temperature may be greater at the works than at the consumer meters, still the higher pressure at which gas is measured at the works may more than counterbalance either pressure lost through friction or decreased temperature of the gas on its way to consumers. Wherefore gas may be supplied without any loss or leakage whatsoever. Is this conclusion correct? Then let us consider the other meaning. If the condensation of the gas, and thus causing less volume. Of course we understand that the liquefying process takes place after the gas is measured at the station-meter. Now the diluents hydrogen, marsh gas, and carbonic oxide are not liquefied, neither is the illuminant ethylene (olefiant gas); it can only be the volatile hydrocarbons and aqueous vapour. But it is found, as a matter of experience, a routine fact in well-managed works, where there is no heavy pressure nor too small pipage, that these volatile hydrocarbons, &c., are carried to the consumers; therefore, in well-managed works, there can be no liquefying or condensation of the gas, and thus no deficiency in volume. Wherefore gas may be supplied without any loss or leakage whatsoever. Is this conclusion partaking of the nature of a *reductio ad absurdum*? If so, may there not be still another meaning—viz., that when the volatile hydrocarbons are deposited, the hydrogen and carbonic oxide are carried by the gas, and thus being the meaning, then to speak of being "reduced to condensation," is only stating part of a fact, which, unless fully expressed, has no significance.

I think it is now plain that the subject of leakage gives rise to many difficult and thorny questions, but the latest attempt to brush them all away has been made in a paper by a highly respected personage, who states "that we quite agree that the gas sold per ton of carbonized is the crucial test of successful management." Now, I would not dare say even what I intend saying, were it not that I am confident of having right on my side. That I may raise no man of straw, what is the meaning of the statement that the gas sold per ton of carbonized is the crucial test of the variation in the species? It is obvious that different kinds of coal have different productive powers, and that consequently, unless there be known the ratio of gas sold to gas made, we are completely in the dark. For instance, a coal gives in practical working 10,500 feet of gas per ton, and the other coal 8,500 feet, which leaves a difference of 20 per cent. Another coal gives 9,500 feet of gas per ton, which leaves a difference of 8,300 feet, leaving a difference of, say, 8 per cent. Yet in the one case there were sold 9,500 feet, and in the other and better case only 8,300 feet, or a difference of 1,200 feet per ton, and possibly the gas was sold at the rate of 100 per cent. To speak of the quantity sold per ton without taking into consideration the difference in the quality of the coal, is to me a most strange proceeding; but if it be said that, whatever sense the words may convey, there was no idea of considering the gas sold irrespective of the gas made per ton, then, after all, the old question of leakage in its many forms, like a ghost in view.

One word more. Each manager knows the value of his apparatus for manufacture and distribution, and it is his duty, either at once or gradually, according to circumstances, to apply the proper remedies.

Discussion.

The President, in inviting discussion on the above paper, said it was on a subject about which many persons felt keenly, and on which adverse opinions prevailed.

Mr. R. MITCHELL (Coatbridge) said that Mr. Niven, in his opening remarks, did not refer to the law of exosmosis. The law, he (Mr. Mitchell) thought was a point upon which few men of lengthened experience had any doubt. He did not mean to bring his own experience to bear on the question, but he might say that he had examined some very old mains in the Coatbridge district, and found so much dead exosmosis prevail, that he was almost sure to find some of the pores of the metal; besides, the metal was greatly reduced. Gas had decidedly a very great influence upon metal, and he did not consider that the test referred to by Mr. Niven, 24 hours after a main had been laid, was sufficient. It was not a proper trial on which any gas engineer should base his opinion, and he was sure that the test was not a fair one. That Mr. Niven would have touched upon the difference of temperature in gas at the works and at the point of ignition. He considered that this was one of the most serious causes of the loss of gas, for he knew some gas-works in which the gas was passed through the station-meter at temperatures ranging from 70° to 80° in winter, and before it reached the consumers it was 80°, the difference amounting to about 7½ per cent. of the volume. This formed an important part of the loss which was complained of in certain districts. Further, as to the quantity of gas being regulated to the supply to the town, he might say that in every works where there was a good station governor, this governor should regulate the quantity of gas according to the requirements of the town. Of course, if there were 15-10ths pressure on, that pressure would remain though there were only half-a-dozen lights in use. Then as to the jointing of pipes he had had considerable experience, and was of the opinion that the jointing of pipes was one of the worst causes of underground workings existed. If a lead joint was used, the joint gave a little, but the turned and bored joint snapped, and the consequence was an escape. When it was remembered that a hole one-tenth of an inch in diameter, with a pressure at 5-10ths, allowed an escape of 42 cubic feet of gas per hour, the maining of pipes was a very serious matter. He was in a mining district if turned and bored joints were used and gave way.

Mr. S. DALZIEL (Kilmarnock) said, with reference to the testing of pipes, he did not put much confidence in the test referred to by Mr. Niven, for the reason that he had put gas into sound lead pipes, and had found that within 24 hours little or no gas was left. In a large number of cases, with respect with pipes, say that the gas was turned off in the morning, in 24 hours afterwards it would be found, on proceeding to light it, that a blue flame proceeded the luminous flame. This could only be explained by exosmosis—the gas had passed outwards through the pipes. He might say also that he had filled a glass tube with gas, and after the stop was closed, the gas evaporated. A serious source of leakage was to be found in the service-pipes. He had come across two instances of this. Recently he relaid the mains in a large street, and found only one fracture; but the service-pipes were in a deplorable state, and yet in the street there was not a single complaint from an inhabitant. After the street was relaid, he found a considerable difference in his holder—as much as a sheet of gas in a 50-feet holder. He could not have believed that there would have been so much difference if he had not proved it in this way. With regard to the turned and bored joints, he had some experience. On the advice of certain gas engineers, he tried these joints, and could assert that they were a source of annoyance until he learned them off. The pipes were laid partly on a hill; there were a few curves, but not

very great, and some heavy traffic passed along the road. The pipes had not been long laid when three or four, in a distance of some 400 yards, split at the faucets, in consequence of the traffic. Another important thing Mr. Niven had overlooked was the pressure there was during the day. This played an important part in the leakage account, and the pressure at which some managers had to work during the day told very heavily against them. In some works the pressure was 4-10ths or 5-10ths during the day, while in other works, on account of their position, the manager had to put on a pressure of from 1½ to 1½ inches in one part of the town, and have only 4-10ths or 5-10ths at another part. Last year he reduced the pressure at which the gas was supplied in Kilmarnock, and sold 400 feet more gas per ton of coal carbonized, and was satisfied that, if he could work with 5-10ths or 6-10ths of pressure, he could sell from 400 to 500 feet more gas per ton of coal carbonized. This was a point which was not mentioned, and he thought it ought to be more thoroughly investigated. If the pressure were doubled, one-half more gas would be sold, and if the pressure were reduced there would be one-half less leakage. If one town were to be compared with another, it would be found that the man who had the highest leakage account was the best man, because he might be that owing to the position of his works, he had to give a heavier pressure, and this heavier pressure told upon his account. In his own works, for one part of the place he worked with a pressure of 18-10ths, and in the lower parts of the town the pressure was 4-10ths; but he knew that if he had to provide for a more level district he could effect a great saving in gas.

Mr. J. M'GLICHRIST (Dumbarton) thought the term "humbug" which had now become famous, was misapplied when Mr. Niven spoke of the average meter system. There was no system in existence at the present time which was so good as the factory system. In many years he had no satisfaction in London as to the quantity of gas consumed in the public lamps, even with the governors that Mr. Niven referred to, and it was only when the average meter system was brought into operation that complaints were removed. He (Mr. M'Glichrist) thought the system should be made the basis of the corporation. In different districts of a town there must of necessity be variations in the pressure, and if a meter was placed at intervals of a dozen or two dozen lamps in a particular altitude, and with the exercise of a little supervision over the lamp-lighters to see that they lighted the metered lamps properly, an accurate approximation would be made of the quantity of gas used. That was the system adopted in Dumbarton, and it gave very great satisfaction. Mr. Mitchell remarked that turned and bored joints were quite unsuitable where there were underground workings; but there was no doubt that the half-turned and bored joint was the best that had yet been introduced. Mr. M'Glichrist was not at all in favour of the turned and bored joint with these joints, and there had been no leakage from them. As to Mr. Dalziel's remarks about pressure upon the mains, he thought he made out a very bad case for himself, because he said that in the low-lying parts of the town there was only 4-10ths of pressure. It was well known that the pressure was not uniform, and that in some parts of the mains, and also that for about three-quarters of the year full pressure was not required, so that as the mains in Kilmarnock lay at a low level, the Manager there had the advantage. A gas-works on the top of a hill, as at Kilmarnock, must be more favourably situated, so far as leakage was concerned, than was at the foot of a hill.

Mr. NAPIER (Grief) said he could corroborate Mr. M'Glichrist so far. The best part of the town where he lived stood very high, and he could assure Mr. Dalziel that at the lower half of the town the pressure was only about 5-10ths, while in the upper district, if the mains were tapped, the pressure would rise to about 15 inches. He was not at all in favour of the pressure had been found at these points to be about 18 inches. If he had heard Mr. Niven aright, he (Mr. Niven) thought 18 inches of earth sufficient to cover the mains. Now all his (Mr. Napier's) mains happened to have about 18 inches of covering, and a good many of them were turned and bored joints, and he was not at all in favour of the turned and bored joints, as he thought, though there not being a sufficient covering of earth. He was now giving them 30 inches of cover, and thought that in most cases this was the remedy for faulty turned and bored joints. As to Mr. Mitchell's remarks in reference to old mains, he might say that about 36 years, and very few of them seemed to be at all corroded.

Mr. M'GLICHRIST remarked that he did not think the corrosion was due to the gas. Perhaps it was owing to the quantity of cinders that had been used in making the roads in the district.

Mr. M'GLICHRIST said that he had previously he took up 1200 yards of 5-inch pipe, and there was not 3 feet of it that could not have been cut with a knife, and the gas found its way quite easily through the sides. The whole of the surrounding soil was black in consequence of the gas passing through the pipe. Whether it was the action of the soil upon the pipe, or the action of the gas upon the pipe, he could hardly determine; but he attributed the condition of the pipe to exosmosis.

Mr. M'GLICHRIST said that in Dumbarton there were many places where the pipes had been in the ground for more than 36 years, and he even knew places where they had been laid for 50 years, and except that they were a little rusty, they were in perfectly good condition. He knew that in Bo'ness pipes had been taken up in exactly the same state as Mr. Mitchell had described. This, he thought, was conclusive evidence that it was not the gas which was at fault, but the soil in which the pipes were embedded, because if the corrosion was due to exosmosis, the law ought to be good in the one case as in the other.

Mr. BROWN asked whether it might not be attributed to the quality of the iron.

Mr. JOHNSTON (Hamilton) said he could bear out Mr. Mitchell's remarks as to the condition in which pipes were found on being taken up. He remembered lifting some pipes in Castle Street, Hamilton, and they were so eaten away that they could have been "whittled away" with a knife. He called Mr. Dalziel's attention to the pipes at that time, and they both came to the conclusion that the corrosion was due to the action of the gas. It could not have been due to the presence of cinders in the soil, because no such thing could be found in the street mentioned.

Mr. SINCLAIR (Rothery) remarked that 21 months previously he took up a number of 5-inch pipes. These he had cleaned, and if they were only coated, they might be so eaten away that they would be of no use or weight or value. He called Mr. Dalziel's attention to the pipes at that time, and they both came to the conclusion that the corrosion was due to the action of the gas. It could not have been due to the presence of cinders in the soil, because no such thing could be found in the street mentioned.

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though if pipes were laid in ground largely composed of engine ash, one might be prepared for the metal crumbling away after a time.

Mr. NAPIER said his experience in reference to malleable and cast iron pipes was this: He had called several cast-iron services which were as good as on the day they were laid down; but 15 years seemed to be about the outside for a malleable iron pipe to last. Such pipes become very brittle. In his district the soil was, as a rule, gravelly.

Mr. RENFREW (Langbain) said he had 24 inches of pressure at his works, and 12-10ths in the village. With a pressure of 14 lb. at the works he could scarcely get a supply of gas in the village, and yet there would be something like 3 or 3½ inches of pressure at some of the houses. His mains were 4-inch where they left the works.

Mr. NIVEN, in reply, said that in the discussion of his paper the law of exosmosis, or the escape of gases through pipes, was apparently being principally considered. He could not but agree with the remarks which had been made, but he qualified his concurrence in them by saying that, in so far as gas-pipes were concerned, exosmosis could be passed as a fact of no moment. He had brought, as proof, the testimony of Mr. W. J. Warman and Mr. G. Anderson; Mr. T. Haverley also held the same opinion. But independently of this, some persons considered that where there was heavy pressure there was, to a certain extent, a separation of the carbon and hydrogen molecules in the gas, and the hydrogen made its way through the metal of the pipes, and left the carbon, and thus the ultimate power of the gas, at a certain distance from the works, was more or less deteriorated. However, in so far as pipes were concerned, the cases Mr. Mitchell quoted simply showed that his pipes were in a bad condition. He (Mr. Niven) did not speak of gas passing through decayed pipes, or pipes in an abnormal condition; and gas passing through such pipes did not do any harm, as the gas was not in contact with the exosmosis, but rather of the bad condition of the pipe. The law in question was only illustrated with gases left entirely to their own elasticity, without being under any initial or outside pressure.

The condition of the pipes referred to arose either from the nature of the gas, the nature of the soil, or from the nature of the pipes, and the latter was the soil. If it arose from the nature of the gas, there could be some-what similar throughout the length and breadth of Scotland, there must be, not only in Hamilton and Coatbridge, but elsewhere, similar conditions of piping, and yet pipes which had lain as long in the ground as in the case of the pipes mentioned did not show any such abnormal condition. This proves that it was not the gas, but the nature of the soil, and the two remaining alternatives were the nature of the material from which the pipes were made, and the nature of the soil. Between these two he could not decide. He was inclined to believe that it was the soil. He could not think it was the pipes, for this reason: Cast iron had a certain percentage of carbon, and it is this carbon that enters into contact with the oxygen, and the carbon underwent some chemical change through contact with the iron, so as to soften the iron, he could not see that this had anything to do with the decay. But perhaps this cause and the nature of the soil were at work to bring about the decay of the pipe; or, perhaps, the decay was due to the energy of the gas, and the presence of carbon and iron of the piping in presence of some acid in the soil. He did not, however, think they were able to decide this point. With regard to Mr. Dalziel's remarks, he did not think he had proved the law of exosmosis sufficiently, because if the gas was turned off at the meter before it was turned on at the brackets, with a pressure of 14 lb. at the works, no air would pass off before light was obtained; but if the gas was turned off at the brackets and then at the meter, the gas could be lighted the moment it was turned on. Mr. McGilchrist wished to put Mr. Dalziel into a corner with reference to pressure; but he (Mr. Niven) thought it was unnecessary, because if there was a great deal of gas, and a great deal of greater volume on account of the difference of barometric pressure, then by a parity of reasoning there was a loss arising from the reduction of pressure. It came, then, to this—that managers liked, if possible, to have their works on as low a site as they could procure.

Mr. NIVEN said that the cause of the great deal of leakage in some towns was the condition of the meters. He knew that in Port-Glasgow a considerable portion of the leakage was due to this cause. He had, he said, tested a good many meters during the previous 18 months, and in many instances they were condemned. If meters were constantly watched and properly worked, he was as keen to keep them in order as the consumption of gas would be found to be greatly increased. It would generally be found to be the case that when a new meter was substituted for an old one, there was an outcry about so much more gas being used. His experience compelled him to say that another source of great leakage was to be found in the small pipes. In Port-Glasgow, for instance, he had a great many of the services, put on valves, and divided the whole town into districts. He fitted valves upon the mains, from 12 inches down to 7 inches, and put a pipe on each side of the valve, and fixed a meter between the valve. He then shut the valve, and passed the gas from the one pipe to the other, taking care that the different sections were turned off, and in this way he ascertained whether there was any leakage in the section he was testing. He found that the large mains were in comparatively good order, but in some of the smaller mains he discovered a great deal of leakage. In some instances the source of the leak was at a great distance from the place where the small pipe was first discovered. Some of the pipes—he could not tell how long they had been underground—were in a bad condition, especially where they had been laid in a clayey soil; but where they had been laid among ashes they were in a rotten state. They seemed to have been eaten as if by acid, and upon the application of the slightest pressure they would snap like a pipe-shank.

Mr. R. MITCHELL (Coatbridge) read the following paper, entitled,

NOTES ON THE VALUATION OF GAS-WORKS.

It is not my intention at the present time to enter into this subject on the broad basis of valuation of works, such as in cases of transfers from one company to another. I will, however, make a few remarks on the rateable value of gas undertakings, and how to arrive at it.

I fear this subject does not receive that amount of attention which it claims from us as managers of companies. Too much is often left to the assessor, who, not perhaps from any desire on his part to overrate, but from fear in the interest of his company, thinks it better to overrate the nature of the property and its ramifications, and places a rental upon it which would bear no comparison with other undertakings having the same turn-over, and, may be, greatly increased profits.

It is not essential that there should be a recognized mode of valuing gas undertakings, so as to arrive at the very rent, or rateable value from year to year, for parochial and other assessments. To arrive at this we must have a basis, and must have recourse to the balance-sheets and books of the company, in order to ascertain the profits accruing from the gas undertaking. It is really the groundwork for determining the rent which the concern could be let for from time to time. Some might say this should not be so, because if a good year's profit is made, the tenant of the works is not benefited as he ought to be, having thus increased taxation. A fixed principle must be adopted, and if certain conditions are observed, I consider nothing fairer can be laid down.

Having arrived at the profit made in one year by a company, and the

value of the works occupied by them, no tenant or outsider could or would give a rent equal to that amount; still there are works rated upon their entire profits as rental, and one instance I know where the rateable value exceeds the year's profits by nearly £400. This would simply mean ruin. What would come over the interest on the tenant's capital required to carry on the works? What would become of his stock-in-trade, his retorts, meters, and other appliances, not to speak of his remuneration for time spent in superintending and carrying on the works?

To enable a man to do legitimate business, he must deduct from his gross profits such amounts as will enable him to carry on his business, allowing for all risks and repairs—giving him a fair interest for the capital floating, say at 4½ or 5 per cent. interest on the capital represented by the gross profits, and then deduct from the balance the sum for remuneration, which should not be less than 10 per cent. on the total amount of the capital employed. Until this subject has the consideration of every manager, we shall not be without cases parallel to the following:—

Works making	Cub. Feet.	Last Year.	This Year.
" "	40 million	£1250	£1800*
" "	35 "	400	1000
" "	18 "		entire profits
" "	20 "	1016	1016

When the town or district is supplied by a corporation, some of the representatives might not be inclined to look narrowly into this matter, as the rates paid from the gas-works funds would go, to a certain extent, to subsidize the local taxes; but in the case of a private company I think every manager should consider it to be his duty to lay before the assessor or his commissioners the proper state of his undertaking, and thus be saved any trouble or annoyance attending pleading diets and appeal courts, when it is only what is right that is wanted.

Discussion.

The PRESIDENT said this was a subject requiring great attention, as a large amount of money was swallowed up by the way in which gas-works were rated; and unless assessors were checked they might be inclined to put a value upon them.

Mr. RENFREW remarked that this year his works had been valued at three times the amount they stood at three years before. On making inquiries he found that the basis on which the assessor proceeded was the same as was adopted for railways, canals, and tramways—viz., the average of three years' profits, deducting 30 per cent. for working expenses. There was no appeal from this valuation.

Mr. SINCLAIR said an assessor had no right to look at a company's balance-sheet. He had only to know what the works cost, and what the expense of maintaining them would be, and then allow a fair amount for profit.

Mr. NAPIER could bear testimony to the accuracy of Mr. Mitchell's statements. In his case the assessor exercised his right not only to see the balance-sheet, but to examine the whole of the Company's books. He (Mr. Napier) was rather surprised to hear Mr. Mitchell say that one company was assessed on the extent of its undertaking, and that another was assessed on a recognized rate throughout Scotland to take the gross profits of five years, and allow 15 per cent. as tenant's profits on two-thirds of the working expenses. He took some trouble in preparing a statement so as to meet the assessor. He was asked to put himself in the position of a hypothetical tenant. The gross profits for the last five years were taken at £650; the assessable rental was put down at £470. Then he found that in his case the Company did not insure the works fully. He would insure up to the full amount, and if he were to take a lease of 50 years, the price and quality of the gas would be fixed. He would require at least to pay interest on the working capital, and he would require to give the Directors a guarantee that he would implement his contract, and for this guarantee he would require to pay £25. Then, in order to put the works in the same state as that in which he found them, he would require at least 14 per cent. on the subscribed capital of £4000, and this would be £560, making a total of £625, and he would have £25 left himself as Manager. This state of affairs was submitted to the assessor, and the Company obtained a reduction from £470 to £375.

Mr. SINCLAIR inquired whether this was the income-tax assessor or the valuation assessor.

Mr. NAPIER replied that it was the valuation assessor. The Company sent in a statement which was evidently not satisfactory, and the assessor called to see the books.

Mr. MCGILCHRIST said he could assure Mr. Sinclair that companies did not generally get on so well with the assessors as he did. In Dumbartonshire they had had a great deal of trouble, and they were obliged to go to the assessors to see what they were doing, and they appeared to lay on the assessment as heavily as they possibly could. The rates took more than 8½d. per 1000 cubic feet of gas sold in Dumbarton, while in some other towns it was scarcely 1d. per 1000. The Renton Company had more than once appealed against the assessor's valuation, and the gentlemen representing the Company put forward a very fair system. He said, "We will allow you to assess us upon the amount of profits we pay to the Shareholders." He (Mr. McGilchrist) thought no better basis for valuation could be than that of assessing upon the profits paid to the shareholders of any company. It would save a great deal of trouble, and it would satisfy all parties. Mr. Jeffrey (Glasgow) remarked that as the assessors seemed to have no fixed method of valuing, it would, in his opinion, be a good thing if corporations and gas companies would amalgamate, and have the question properly settled, so that all gas companies might be put upon the same footing.

Mr. RENFREW said he went to a lawyer and asked him whether it was worth while to appeal, and the lawyer said, "No." According to the Act for assessing these companies, they were charged upon the average of three years' profits.

Mr. MITCHELL, in reply, said he was glad the paper he had read had brought out such a discussion, and he thought Mr. Jeffrey's remark about amalgamation, in order to have this matter definitely settled, was very pertinent. He did not see that the assessor had a right to put on any valuation he pleased. In the assessor's office in Glasgow he remembered seeing a number of companies which appealed against the decision of the assessors. One of these was the Inverary Gas Company, and in their case the Court at once agreed to reduce the rental.

(To be continued.)

AMONG the awards at the recent "International Food Exhibition," at the Agricultural Hall, we notice the following:—Silver medals to Messrs. J. C. Greene and Son, for cooking apparatus; and Mr. E. A. Maiguen, for his "fritre rapide." A bronze medal to Messrs. H. C. Davis and Co., for gas-cooking stoves. A certificate of honourable mention to Messrs. West Brothers, for gas-cooking stoves.

* In this case the valuation was increased, without any known cause, from £1250 to £1800. This was appealed against; and the Court, after considering the facts, agreed that the rent for the current year should be £1100, which made a reduction on the taxes of £75 16s. 8d.

OPENING OF NEW WATER-WORKS FOR THE DONCASTER CORPORATION.

On Wednesday last the new water-works which have, for the past six years, been in course of construction for the Doncaster Corporation at Thrybergh, about four miles from Rotherham, were formally opened by the Mayor (Alderman R. E. Clark).

The works are of considerable extent, and have cost about £200,000. The first and largest tank, in the spring of 1874, and the foundation-stone laid on the 16th of December of the same year; and since this time the work has been carried on by the Resident Engineer and the Contractor. There are three reservoirs, the principal one, at Thrybergh, having an area of about 60 acres; and the other two, situate at Silverwood and Ravenhill, which act as overflowers of the main reservoir, cover a combined area of between 15 and 20 acres. The three reservoirs will provide capacity for holding 250 million gallons of water, which will be gathered in the neighbourhood of Silverwood and Mickelbergh. This is admittedly a very fine watershed, and by means of the new works the inhabitants of Doncaster will be placed in the position of a supply of the present excellence, of which they have long been in need. Up to the present time the water for culinary purposes has had to be pumped from wells in various parts of the town, and that for domestic and manufacturing requirements has been pumped from the Don. To give the reservoir the desired capacity, a depth of 52 feet was determined upon; but owing to difficulties experienced as the work progressed, a depth of at least 100 feet had to be gone to. This was occasioned by the fact that when the basin was prepared for the reception of the water, and it was filled, the water began to disappear. The cause was ascertained by further digging, and the discovery was made that the water was passing through a rock below which contained an immense fissure. The leakage on this account was serious, and it was decided to go down as far as the blue shale. This delayed the opening of the works for at least twelve months. The difficulty has, however, now been satisfactorily overcome, the bottom of the fissure being filled with concrete, and the water level of the high-level water-mark, at which it will contain 230 million gallons. The filter-beds for the three reservoirs have been fixed on the left hand of the main reservoir. The filters are composed of various layers of gravel and sand, each 6 inches in thickness. First, however, come the perforated filter-beds, which are then a layer of broken stone, and a lower down some various beds of walnut gravel, beans, and peas, and not grass, as at finally 2 feet of Trent sand. A meter-house has also been constructed, by which the amount of water supplied daily will be registered. The water will run to be carried about 8 miles before it reaches Doncaster. It will first run by gravitation direct from the main reservoir to Warmworth, where a reservoir will be built, and then by a tunnel, 12 miles in length, the chief one being at Denaby, through which pipes have been laid for the passage of the water. A tunnel, called the Conisbrough Park tunnel, has also been constructed, to carry the water from the Conisbrough Park stream to the reservoir; whilst a 4-foot diameter conduit, a mile in length, has had to be laid to the River Don, the water being raised by a pump at Thrybergh. A large and commodious house has been erected near the embankment of the Thrybergh reservoir for the accommodation of the Manager, who will always reside on the spot.

Upon reaching the principal reservoir, the Mayor, who was attended by the Resident Engineer and the Corporation, proceeded to the lower part of the embankment, where the formal turning on of the water took place, the Engineer (Mr. B. S. Brundell) having handed to the Mayor a key for the purpose. The Mayor, after he had turned on the water, delivered an address, in which he congratulated the burgesses on the completion of the works. The Mayor then proceeded to the upper part of the embankment, and partook of luncheon, upon the conclusion of which several toasts were drunk, including "Success to the Doncaster Water-Works," which was proposed by the Mayor, who stated that when full the large reservoir was calculated, without rain, to supply the town of Doncaster for 240 days, and that the Mayor would be present on the 1st of January to celebrate the event—the Mayor presiding.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

In this district prices generally are hardening so far as round coals are concerned, and the following (which are the rates now to pay higher prices than have been accepted a short time back. The commencement of November a general advance is being carried out in the Wigan district, ranging from 6d. up to 1s. per ton in some cases. This, however, does not so much represent an actual advance upon the list prices as the fact that the summer prices have been so low, and upon what have been the real selling prices, and it is questionable whether, in the face of the agitation on the part of the men for an advance of wages, colliery proprietors will carry out any very material upward movement, which, whilst being only temporary, might lead to higher wages being paid, which would probably be permanent. In the Manchester district a further advance of 10d. per ton is being made in the delivery rates to private consumers, but pit prices are not undergoing any very material change. Classes of fuel for manufacturing purposes are not being affected to any very appreciable extent by the upward movement in the prices of large consumers for ironmaking and steam purposes, who are able to place their orders on pretty much the old rates. Engine classes of fuel continue remarkably firm, considering the largely increased production of slack, and it is only in exceptional cases where any concessions are at present being given. The average prices at the pit mouth are about 5s. 6d. to 5s. 9s. for best Wigan Aley, about 5s. 6d. to 7s. for good second qualities, about 7s. for good Pemberton four-feet, 5s. to 5s. 6d. for common coal, 3s. 9d. to 4s. 3d. for burgy, and 3s. to 3s. 6d. for good slack.

Although there is no really stronger tone in the iron market, the amount of business doing during the week has been larger, so far as pig iron is concerned, and local makers have effected some tolerable good sales for delivery over the next three or four months at about late rates, which range from 46s. 6d. to 47s. 6d. per ton, less 2½, for delivery into the Manchester district. Finished iron has been only in dull demand, and although 48 per ton is the average quotation for bars delivered into the Wigan area, there are sellers who would take as low as 45 15s. for prompt specifications.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

There has been a falling-off in the quantity of coal shipped at Cardiff during the last week to the amount of 45,564 tons as compared with the previous week; but 9925 tons of iron were exported, with a fair amount of fuel and coke. The shipments of coal at Newport for the last week show a falling-off when compared with the previous week. The same may be said of the instances prices remained firm. Employment at the iron-works is considered fairly good. There was a decided improvement in the demand for iron. The returns of the steam coal shipments at Swansea for the last week show a falling-off over 2000 tons, and in patent fuel of nearly 1000 tons, but when compared with the previous week the quantity shipped is not so much to the want of tonnage, and not so much to the want of orders. The prices of all descriptions of steam coal remain very dull, and at the

present time an advance is not looked forward to favourably. The local works are fairly active in the metal department. Iron is more steady; it is the opinion that the minimum price has been reached, and it is expected that buyers who have been holding back will now come forward with orders. £5 to £5 5s. per ton is quoted f.o.b. Welsh ports for new iron rails, old rails being offered at about £3. The demand for scrap is nil. Steel rails appear to be in fair request at prices ranging from £8 to £8 5s. per ton f.o.b. Some of the local works have been fortunate in securing several good contracts. No improvement is shown in regard to tin plates. Several large parcels are reported to have been sold through second hands at very low prices.

At the Tredegar Iron-Works a new blast furnace—the fourth of the kind—has been blown in, and is now in full operation. These furnaces are producing a large quantity of the celebrated Tredegar pig iron, which realizes the highest quotation in the market. Two of Cooper's stoves are attached to the furnaces, the first of similar construction that have been introduced into this district. The new coke ovens are doing good work, and the coke is of the best quality. The new arrangements for filling the ovens and drawing the coke possess many of the most recent improvements, no manual labour being required from the time the coal reaches the bunk till it is emptied into the trucks in the form of coke, and the coal is screened, washed, taken to the oven, and withdrawn entirely by machinery. The whole arrangement of the furnaces and coke ovens give evidence of the most advanced acquaintance, on the part of the management, with every scientific and practical point connected with the production and manufacture of iron, and places the Tredegar Iron-Works in a prominent position amongst kindred industries throughout the country.

In the colliery department unusual activity prevails, the work of sinking a new pit at Darran being pushed forward with all despatch, and when completed it will afford employment to some hundreds of hands. The celebrated steam coal vein will in time be reached by the aid of the diamond drill, which has been recently introduced. The new system of coal and coke sent off daily over the North-Western Railway system is a proof of the great revival which has been experienced of late in these particular branches.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Both coals and coke are experiencing an improved demand in this district. The markets, too, for the last week, have been noticeably stronger, as all kinds of household coals are more eagerly sought after. Quotations, however, are but little different from those that have been ruling, the price of the best quality of coal being only 1s. 6d. per ton. The price of all ordinary kinds of fuel raised in this district will shortly be made. Nothing of a definite nature has as yet been resolved upon, and beyond the strength of the demand, and the inclination of colliery proprietors to hold back quotations for large contracts and inquiries, there is no indication of change in the market. The price of the best quality of coal, and in fact, all other kinds of manufacturing stores, are still of slow sale. There is perhaps less underselling, and scarcely so much activity on the part of some of the local coalmasters to obtain contracts for the supply of local consumers.

The iron trade is unmarked by any signs of improvement, and the demand is scarcely so good for finished iron as it was a fortnight ago. The Wolverhampton market on Wednesday was but thinly attended, and orders were somewhat scarce. The most taking kinds of finished iron were perhaps sheets, hoops, strips, and a few others of the miscellaneous class. There was a heavy demand for iron for the supply of the export, and for tube strip, were the most notable features of the finished department. Unmarked bars were quoted at £6 5s. to £6 10s. The pig trade was also unusually dull, and the nature of the business transactions was of the most unimportant character. Small lots of pig-iron, and also of coke, were the principal of the business transactions. The tone of the Birmingham market on Thursday, though slightly better, was still below its ordinary state. Puddled bars received the greatest number of calls, and some few sales of a respectable class were reported to have been made. All-mine, cold-blast, and cylinder pig-iron were in moderate demand, and the market was not so active. Cokes sold well, and there are a greater number of inquiries for the better class, and rates, too, are reported to be slightly higher.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The general coal trade at both the South and West Yorkshire collieries may now be said to be active, there having been great improvement during the past few weeks. There can, however, be no doubt that prices have not improved in proportion to the increase of trade, and this can readily be conceived when it is stated that the output is still greatly in excess of the demand, although many collieries are not raising anything like the quantity they could, did circumstances require them to do so.

The business doing with London by rail from South Yorkshire is fairly active, but complaints are rife that the tonnage is greatly over against sales. The Great Northern Railway is conveying a large tonnage from Hexthorpe, where it is handed over to them by the Manchester, Sheffield, and Lincolnshire Company. A very fair quantity is also taken from a number of the collieries in both districts by the Midland line. A marked improvement is reported to have taken place in the demand for iron, and the business doing with the Western Counties, which just now displays more activity than for some months past. More is also required for the local markets, so that both the Silkstone, Barnsley, and Haigh Moor seams are more largely worked.

Discouraging reports are in circulation with respect to the business doing in the prospects of the immediate future. Some of the contracts placed for export coal are drawing to a close, and the prospects for the winter months are said to be discouraging. As yet, the tonnage for Hull and Grimsby holds well up; but, owing to the hard and soft coal having to be obtained from the same seam, some portion of steam coal is said to be needed.

A good deal of Silkstone coal is just now being used for gas-making purposes; in fact, it is said that the consumption of this class of fuel is larger at the present time than it has been for a long period; the Barnsley and some other gas-works are working almost exclusively on this coal. The locomotive fuel is largely supplied according to contracts entered into some time ago with several of the leading Railway Companies.

Other kinds of fuel, including coke, have of late undergone but little alteration. Makers of coke are turning out a large tonnage, a considerable quantity of which is finding its way daily to the North-Lincolnshire district, where it is largely employed for iron-smelting purposes, there being a large number of furnaces in blast.

The iron and steel trades are in much the same state as when last noticed. There is still an average output of pig iron made, but work at the various foundries is not over so active as it was some time ago, where large quantities of cast and wrought iron are produced. The steel trade is still pretty active, as at works where Bessemer steel rails and tires are produced the men are working full time.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

October will be memorable in the annals of the gas coal trading of the North of England through the enormous loss of small sailing vessels, usually employed in this trade, which occurred in the last week of the month. Wrecked vessels strewn the coast from Berwick to the Humber. And the same day saw the same ships upon the Lincolnshire and Norfolk coasts unprecedented. It is so serious that as the same kind of vessels will never be rebuilt, it will probably precipitate a revolution which has been impending in the sea-borne coal trade—the substitution of a small class of steamers, small tenders, and 14-keel brigs and schooners. Any way, the loss is a grave one, and it is likely to disarrange the carrying of gas coals to many of the larger ports over the winter months. The vessels whose career has thus been ended belonged to nearly every small port between King's Lynn and Devonport, and the slaughter of these ships (though in a much less degree of their crews) has been fearful. The scale of Wexham, Thursday, and Friday found a large number of small ships at sea, and some of them had been knocking about for a month, and had made little progress. Merchants and colliery officers had been short of tonnage, and had experienced much difficulty in completing their orders before the storm arose. But their troubles have been vastly increased by the effects of the late gales.

The gas collieries would show an active business, provided the tonnage were forthcoming and were kept in regular supply. A quantity of gas coals were stowing at the dock heads in trucks waiting the arrival of the gas coal steamers, which had been thrown out of the regular course by the gales of the last week.

The price of gas coals is not materially altered one way or the other. Contracts are running very well, but few go beyond twelve months. No doubt the periodical revival of the electric light scare may have something to do with it, for whilst very few, if any, are time about the future of the gas coal trade, the same with rumours of disaster have the effect of inducing caution in making long engagements. Ordinary kinds of coals improve in value, whilst the demand for steam coals is mainly for best qualities. The quotations for coke for shipment have improved. The business which was transacted last week in small and manufacturing coals was pretty good.

The ordinary Baltic trade is drawing to a close. During the early part of this month medium-sized steamers will come out of it, and go into coasting. There will therefore be a larger supply of the useful class of tonnage at the disposal of the gas trade.

The manufacturing trade of the north-east ports, especially in bricks, chemicals, and cement, is very quiet. Manufactured iron is likely to show an advance in price between this time and the spring. Lead has improved in value at the last sales, which took place on the Tyne last week. Timber of all descriptions is quite equal to the demand. It is found impossible to establish an advance in the price of it.

THE WATER SUPPLY OF BRADFORD-ON-AVON.

At the Meeting of the Bradford-on-Avon Town Commissioners on the 19th ult.—Mr. T. B. SAUNDERS in the chair—a report was presented from the Water Committee relative to the obtaining a supply of water for the town from Avoncliff, where two shafts had been sunk and samples of water taken for analysis. Such analysis had been made by Mr. Stoddard and Dr. Frankland, and the Committee reported that after perusing the reports furnished by these gentlemen, they felt satisfied that the quality of the water was good, and the only available quality sufficient for the supply of the inhabitants. They accordingly recommended that the analyses, or copies of them, should be forwarded to the Local Government Board for their consideration, and that they be asked to sanction the obtaining of the supply of water for the town from this source instead of from the wells originally proposed, and that the Board be asked to allow such modifications to be made in the scheme approved of by them in August, 1878 (when they sanctioned the loan of £6000), as would enable the Commissioners to carry out these recommendations, having regard to the proposed new source of supply, and the consequent alteration in the estimate of the cost of the works.

Mr. WILKINS, in moving the adoption of the report, said the question of the water supply had been a very trying one, and he hoped that in the event of the Local Government Board sanctioning the proposed scheme, the Commissioners would find water which would be advantageous to the inhabitants. He had been told by the best plan would probably be to have filter-beds. With these they would have water as good as, or better than any in the neighbourhood.

Mr. WILKINS seconded the motion.

The CHAIRMAN remarked that he did not see it mentioned in the report that the water had risen or fallen more than 2 inches. There certainly were points he thought the Committee had overlooked. He wished to get a good supply of pure water for the town. It was not for him to give an opinion on the analyses—this he left entirely to scientific gentlemen; but he did not like the word "turbid," any more than he did the statement that the water was "fairly good potable water." He would rather see it classed as "A 1."

Mr. WILKINS said the desire of each and every one was to get a good supply of water for the town. Some of the Commissioners took one view, and some another, but they might depend upon it the Local Government Board would take the care to see that the water was of the best quality that was think desirable for the town. An Inspector would be sent down, and he would approve or disapprove of the proposal. He asked them to remember that the work of the Committee was of a preliminary character.

The motion for the adoption of the report was then put and carried.

SALE OF GAS AND WATER SHARES AT CHATHAM.—On Thursday, the 21st ult., Messrs. Kidwell and Son offered for sale, by auction, two £12 10s. "B" shares in the Rochester Gas Company, which were purchased for £13 10s.; and two similar shares were sold for £11 5s. Six Rochester Water Company shares were also sold for £10 12s. 6d. per share, whilst six £10 "B" shares in the Sheppy Gas Company, entitled to a dividend of 10 per cent., were bought at the rate of £20 15s. per share.

FATAL ACCIDENT AT THE PLYMOUTH GAS-WORKS.—On Wednesday last an inquest was held at Plymouth relative to the death of William Elliott, a blacksmith in the employ of the Plymouth and Stonehouse Gas Company. From the evidence it seemed that Elliott, who had been employed at the works for some time, was engaged in cleaning out a scrubber when he suddenly fell backward to the ground, and was killed instantaneously. No blame was attached to any one, and the jury returned a verdict of "accidental death," but recommended that railings should be put round the tops of the scrubbers to avoid such accidents.

THE POLLUTION OF STREAMS.—At the recent Congress of the Social Science Association in Edinburgh, Dr. Stevenson Macadam read a paper entitled, "What are the means which should be adopted for the Prevention of the Pollution of Streams, without undue Interference with Industrial Operations, and for the Preservation of Pure Sources of Water Supply?" Dr. Macadam remarked at the outset that the subject was one of national

importance. In restrictive view the matter might be confined to riparian proprietors on the one side, and manufacturers, lessees of mines, and town authorities on the other; but, on a wider view, the matter affected the whole country, for all were directly or indirectly interested in the preservation of pure sources of water supply. Any one acquainted with the river systems as a whole would admit that year by year the pollution of the streams was increasing, and the means were being devised. Where improvements had taken place, these had been carried out, not voluntarily by the polluters, but under the more or less compulsory powers obtained by those who suffered by the pollutions. In the suggestion and adoption of remedial works for the treatment of impurities from mines, &c., he had seen the same principle applied to the treatment of effluents from towns, especially during the last ten years. Reference was then made in detail to the nature of the pollutions from mines, paper-mills, paraffin-works, distilleries, woolen-mills, dyeing of calico print-works, skinneries and tanneries, as well as town sewage, and to the various remedial measures which had been successfully adopted. In some of the most important instances, had satisfied all parties concerned. The law for the prevention of the pollution of rivers was fully capable of dealing with the question, provided it was put in force. The riparian proprietors had proved their anxiety not unnecessarily to hamper commercial interests by agreeing to a restriction of the powers to prevent pollution, and the riparian proprietors had consented to execute proper remedial works, and faithfully carried them out. Powers, however, were required for inspectors to originate procedure where gross pollution was observable, and thus put a stop to the continued deterioration of the waters, and render it unnecessary for riparian proprietors to have recourse to legal action.

DEATH OF ALDERMAN MOORE, OF SHEFFIELD.—Alderman Thomas Moore, who was for four successive years Mayor of Sheffield, and who, as many of our readers will recollect, took so active a part, a few years since, in opposition to the Sheffield United Gaslight Company and the Sheffield Water Company, died on the 22nd ult., aged 61. In regard to his agitation on the subject of the gas and water supply, one of the local newspapers, in an obituary notice of the deceased gentleman, says that his public life was one long fight against the Water Company, and in a less degree against the Gas Company; and the parliamentary campaigns on these subjects, almost invariably arranged where the millinery was initiated by him, and mainly carried out under his direction. Although his influence in these campaigns laid nothing but a large legacy of costs, it is impossible to withhold a certain admiration for his earnestness of purpose, for his persistence under repeated defeats, and for a determination which was not of the least order, to push his cause to the end. It was in 1869 that he commenced to display the fierce antagonism to the Water Company which was such a marked feature of his public life. The occasion was the application to Parliament by the Company, arising out of the disastrous inundation of that year. The Company, it will be remembered, increased their dividend from 10 to 12½ per cent. In regard to the rates 25 per cent. In the determined opposition which this proposal excited, Mr. Moore took a prominent part; but though the Council adopted every possible measure to prevent the passage of the Bill, deciding at one meeting to purchase the Company's works rather than submit to the increased rates, it was in vain. The next year the Company, by the addition of certain requirements inserted by the Lords Committee, as to the time when a full supply of water was to be given; and the term of the increased rating was fixed at 25 years. Mr. Moore in 1865 renewed his warfare with the Water Company, by objecting to the proposed increase of rates, and for many years he increased their works, and to extend the time for the completion of those they had in hand. In the same year, also, the Gas Company applied to Parliament for power to raise additional capital. Mr. Moore joined in the opposition to these Bills, both of which, however, were carried. In the year 1870, in the House of Commons, he introduced a Bill for the reformation, by which the dividend on the new stock was to rise as the price of gas went down, and Alderman Saunders, who was for some time one of the Nominee Directors, reported most favourably from year to year as to the manner in which this arrangement was carried out. In 1871 Mr. Moore made the proposal to erect a Consumers' Company. At the town's meeting called to consider that scheme, its promoters expressed confidence that either the Bill would be carried or that the 25 per cent. would be taken off the water charges, but the measure broke down in its earlier stages, and the Referees were obliged to refer the matter to a jury of arbitrators to decide upon the points to oppose it. In 1868, Mr. Moore was elected Mayor and Alderman; and in the following year commenced the memorable struggle with the Gas and Water Companies. On Oct. 2, 1869, an interview took place between the Directors of the Gas Company and a deputation from the Council of the Water Company, who respectively undertook to carry out the Company's works by the Corporation, and a few days later an intimation was conveyed from the Directors to the Committee of the Council, that the Company had no wish to part with their undertaking, and were not prepared to treat with the Corporation. The result of this was that on Nov. 18 the Council, led by Alderman Moore, who had been elected Mayor, decided to apply to Parliament for powers to purchase the gas-works or to erect new ones. About the same time a similar campaign was opened with the Water Company, who had laid themselves open to attack by an application to the local Justices on Nov. 4 for their sanction to the Corporation, who had joined in the joint application for the purchase of the water-works, and the Corporation had been obliged to pay the waste resulting from constant pressure. The opposition to these proposals greatly prolonged the investigation, which was adjourned from time to time, and the regulations were not finally settled until Feb. 19, 1870. Before this, however—on Nov. 20, 1869, about a fortnight before the regulations were finally settled—the Corporation applied to the Water Company had given notice of an application to Parliament to defer their obligation to give a constant supply, the Council on the same day giving notice of their intention to apply for powers to purchase the water-works. The Corporation had then before them the prospect of a parliamentary campaign against both the Water and Gas Companies. With regard to the Gas Company, further negotiations were attempted, the Council towards the end of December, 1869, offering to guarantee the Shareholders 9 per cent. in perpetuity, or to refer the question to arbitration. This offer was refused by the Directors, who preferred to adhere to the bargain they had made with the Corporation so recently as 1868, and when the Corporation Bill came before the House of Commons Committee in April, 1870, it was rejected, on the evidence of the promoters alone, the Council for the Company not being required to reply. As to the Water Bill, it was also rejected. In the preliminary stages of this contest an injunction was granted by the Court of Chancery restraining the Corporation from expending the rates in the prosecution of Bills in Parliament; but Alderman Moore and others signed a guarantee for the costs, which, however, was never enforced against them. After the Water Bill had been rejected, the Corporation had to meet the City Corporation (Borough Funds) Bill, to meet the difficulty, but they were not sanctioned by Parliament. No further contest with the Gas Company has taken place; but in 1873 Alderman Moore led another attack upon the Water Company. A Bill to purchase the Company's works had been sanctioned by the Council and the ratepayers, but when

it reached Parliament the question of non-compliance with Standing Orders was raised, and the Bill was lost. By the parliamentary contests of 1870 was raised an important question, and one of deep interest to all municipal bodies. While the Bills in 1870 were under discussion, before the opening of Parliament, the Water Company filed a petition in Chancery to restrain the Corporation from applying money derived from the rates towards the promotion of those measures, and a perpetual injunction was afterwards granted. Nothing daunted, however, Alderman Moore and his supporters in the Council raised a guarantee-fund; but the costs remained unpaid for some years. On Oct. 19, 1870, the Council unanimously decided to apply to Parliament for an Improvement Act, in which clauses were inserted authorizing the payment of the parliamentary costs out of the rates. This idea was afterwards abandoned, and the Bill, bereft of every feature upon which there was any difference of opinion, was passed without opposition, Alderman Moore, who had been elected Mayor for the third time in 1870, being the principal witness in its favour. When before the Parliamentary Committees. In 1871 Alderman Moore was the unpunctured point of being placed in the mayoral chair for the fourth time, and it was hoped that during his term of office some plan would be devised for clearing off the still unpaid parliamentary costs. The expedient of a voluntary rate was tried, but only a small sum was raised, and the illegally incurred expenses were not finally cleared away until within the past twelve months. This last and successful attempt to remove a long-standing source of discord was initiated by Alderman Mappin, M.P., and towards the sum that was raised Alderman Moore was a liberal contributor.

APPARATUS FOR LETTERS PATENT.

4293.—LAKE, W. R., Southampton Buildings, London, "An improved apparatus for the combustion of gas, with or without other fuel, for cooking and heating purposes." A communication. Oct. 21, 1880.

4297.—CROSSLEY, F. W., Manchester, "Improvements in gas motor engines." Oct. 21, 1880.
4293.—FORD, A., Stockton-on-Tees, Durham, "Improvements in apparatus used in the purification of gas." Oct. 25, 1880.
4298.—WATTS, P. J., Balham, and CHANDLER, S. and J., Newington Causeway, Surrey, "Improvements in gas apparatus." Oct. 25, 1880.
4344.—GAMSTER, G. F., Reading, Berks, "Improvements in means or apparatus for automatically lighting and extinguishing street lamps and analogous lamps." Oct. 25, 1880.
4350.—WINTER, F., Frankfurt-on-the-Main, Germany, "Improvements in automatic gas lighting and extinguishing apparatus." A communication. Oct. 25, 1880.
4361.—JOHNSON, J. C., Wednesbury, Stafford, "New or improved machinery for welding gas, steam, and water pipe fittings." Oct. 26, 1880.
4395.—BROADBENT, C. A., Hastings, Sussex, "Improvements in gas-stoves." Oct. 27, 1880.
4398.—RHODES, J. C., Blackpool, Goodbrand, W. and HOLLAND, T. E., Manchester, Lancs, "Improvements in gas motor engines." Oct. 28, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

1895.—HOWAT, A., Manchester, "An improved method of and apparatus for holding glasses, globes, or shades for gas and other lights." May 8, 1880.
2804.—AIRD, J., Lambeth, Surrey, "Improvements in or applicable to the valves of gas mains or pipes for the purpose of maintaining a tight joint." July 3, 1880.
3140.—LAKE, H. H., Southampton Buildings, London, "Improvements in gas-engines." A communication. July 30, 1880.
3190.—WESTINGHOUSE, G., jun., Southampton Buildings, London, "Improvements in apparatus for carburetted air so as to render it combustible as gas for lighting and heating purposes." Aug. 4, 1880.

Share List of Gas and Water Companies.

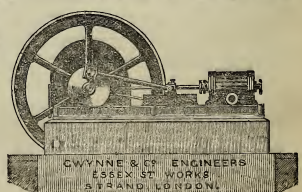
Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Ann.	Latest Quotations.	
58944	£	GAS COMPANIES.	£ s. d.	£ s. d.	£	6300	£	GAS COMPANIES.	£ s. d.	£ s. d.	£	
100	0	Alliance and Dublin	0	10	0	17-173	5	Georgetown, Guyana	5	0	0	
1000	0	Anglo-Romano	20	0	10	0	21-25	30000	100	0	0	
5000	20	Bahia (Limited).	20	0	5	0	135-142	100	0	0	0	
1000	20	Do, 1st pref.	20	0	10	0	35-37	115000	100	0	15	
1200	20	Do, 2nd pref.	20	0	7	10	20-22	100	0	0	0	
40000	5	Bombay (Limited).	5	0	7	10	6-6	100	0	0	0	
10000	5	Do, fourth issue.	5	0	7	0	0	7500	100	0	10	
10000	10	Bournemouth.	10	0	8	0	132-141	5000	10	0	0	
23970	10	Do, 1st pref.	100	0	9	0	153-158	20000	100	0	15	
20	0	Do, 5th pref.	100	0	5	0	95-100	20000	100	0	15	
20	0	Do, D shares	18	0	9	0	6-8-8 p.m.	..	Kingston.	..	7	0
1000	20	Brighton	20	0	10	0	35-37	..	Lea Bridge	..	7	0
5000	20	Brighton and Hove	20	0	10	0	34-36	56100	100	0	10	
14000	20	British (Limited).	20	0	10	0	34-35	160100	100	0	7	
732	20	Caplagiri (Limited).	20	0	8	0	18-19	38500	Sk.	100	0	
1500	10	Colney Hatch.	10	0	5	0	9-11	150000	Sk.	100	0	
5000	0	Commercial.	100	0	11	5	188-193	7622	25	0	6	
70000	Sk.	Do, 7 per cent.	100	0	8	5	115-119	26632	Sk.	100	0	
20000	20	Continental Union.	20	0	6	10	190-213	15000	5	Malta and Mediter-	5	0
20000	20	Do, new.	14	0	6	10	p. ann. 1 p.m.	6000	0	Do, preference.	5	0
10000	20	Do, preference.	20	0	7	0	0	342-35	20000	5	0	
75000	Sk.	Crystal Palace Dis-	100	0	10	0	172-177	20000	5	0	0	
125000	Sk.	Do, 7 per cent.	100	0	10	0	115-120	25000	20	0	6	
30000	Sk.	Do, preference.	100	0	6	0	119-123	8000	10	Netherby, Brazil	10	0
2000	6	Do, ordin. 7 p. c.	1	4	0	7	0	1 p.m.	30000	5	0	
7100	25	Edinburgh.	25	0	10	0	46-48	30000	5	0	0	
2400	10	European (Limited).	10	0	10	0	193-200	10000	5	0	0	
12000	10	Do, new shares.	7	10	0	10	0	63-7	10000	5	0	
35000	10	Do, new shares.	5	0	10	0	10	0	5-10	10000	10	0
49000	Sk.	Gaslight & Coke A.	100	0	11	0	212-217	3000	10	Richmond (Surrey)	10	0
160000	Sk.	Do, B.	100	0	4	0	75-78	3000	10	Do, new	10	0
50000	10	Do, 5th do.	10	0	5	0	75-78	37500	20	Rio de Janeiro	20	0
20000	Sk.	Do, 1st pref.	100	0	10	0	217-222	1500	323	Shanghai.	32	10
300000	10	Do, D do.	100	0	10	0	217-222	15000	0	Sheldiff.	100	0
100000	10	Do, E do.	100	0	10	0	217-222	15000	0	Singapore (Lim.)	5	0
100000	10	Do, F do.	100	0	10	0	160-165	12500	5	Do, preference.	5	0
1300000	10	Do, G 7½ do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, H do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, I do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, J do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, K do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, L do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, M do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, N do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, O do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, P do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, Q do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, R do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, S do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, T do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, U do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, V do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, W do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, X do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, Y do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0
1300000	10	Do, Z do.	100	0	7	0	136-139	2000	5	Do, preference.	5	0

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TO CORRESPONDENTS.

A. F.—Received.

R. B.—Certainly not, within your parliamentary limits.

ENGINEER.—Such a matter must be the subject of arrangement before the transfer. The purchasing Corporation are not bound to pay any compensation at all.

SOUTH METROPOLITAN GAS-WORKS.—Owing to pressure on our space to-day, we are compelled, at the last minute, to hold over the continuation of the description of these works, which, with illustrations of the gas-tank (as completed), is in hand.

Nonotics can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 9, 1890.

Circular to Gas Companies.

The beginning of November is to the elected of the ratepayers in English Municipalities as full of portent as were the Ides of March to the Roman Emperor. On Monday last the official fate of many Town Councilors was decided for the ordinary period of three years, and while some were relegated to the obscurity of private life, an equal number of citizens have taken their places in the honourable and honorary office of ratepayers representative. The functions of local government authorities are easy of comprehension, and they are, as a rule, strictly adhered to in the ordinary transactions of English municipal bodies. To keep watch over the material development of their town, to regulate the conduct of their fellow-citizens, as well as to provide for their supply with all the necessities of modern corporate existence, are accepted by our local authorities as ample and exclusive occupation, to the positive proscription of all those considerations of party politics, the omnipresence of which in similar organizations across the Channel so frequently causes them to be held in detestation by the Central Government. In this respect it is of incalculable advantage that the relations of even our largest Municipalities with the Executive are naturally of a strictly business character, as is the proper employment of the local bodies themselves; so that the question, say, of the application for permission to borrow money by the Corporation of Liverpool or Birmingham, is not prejudiced by the consideration that the Administration of the day is compelled, by political considerations, to treat the application otherwise than on its merits.

Such being the facts, and non-interference in party politics being one of the fundamental rules of municipal life *per se*, it is not a little puzzling to a believer in the fitness of things to find that, in the great majority of instances, the question of who shall be returned to represent ratepayers in matters of street lighting, water supply, or sanitation, depends not at all on the special capability of a candidate for office for dealing with such subjects, and seldom on his known personal eminence, but chiefly, and indeed almost solely, on his notoriety as a partisan in connection with matters respecting which his mouth is expected to be shut as soon as he attains the distinction to which he aims. *The Times*, in a recent leader on the results of the late municipal elections, reflects on this curious inconsistency in the elements of corporate life, and lectures party leaders and managers for their tendency to push the admitted incongruity so far as to injure the public service, by deliberately turning the machinery of local self-government into a party organization with ulterior objects. The complaint is well timed, and the danger is not chimerical; but it is not very clear how any town thoroughly given over to the kind of influences of which the immaculate borough of Eatonswill stands as the great exemplar, is to be redeemed from its evil ways, and converted to the practice of reason. The disease is widespread and endemic where it has taken root, and where it is most virulent nothing short of the drastic remedy which sometimes follows upon a Royal Commission, and makes the name of politician a term of local reproach, will eradicate it. The irrationality of mixing up municipal finance with Conservatism, or jumbling a belief in the propriety of the acquisition of gas-works with the profession of sound Liberal principles, is one of the most hopeless features of the phenomenon, for argument is paralyzed before heresy that laughs at logic. And yet, although so absurd in its details, the origin of the political colouring of our non-political Town Councils is sufficiently rational. The performance of a Councillor's duties involves the devotion of more time and energy than would, in general, be accorded by any man, unless he happens to possess abundant leisure, or has a born liking for public work. In the former case he is unlikely to figure conspicuously in local affairs as a leader of men, but in the latter he is usually already deep in more than one kind of public occupation, and, as a politician by nature, cannot help going into a representative assembly with the party marks upon him. As long as politics excite more attention in town and country than any other subject of public interest, we must expect ambitious persons to make use of the power of party union for every purpose which it can be made to serve—and helping a man into a town council is one of them.

So far we have treated mainly of politics as affecting the candidature of individuals for municipal honours, and have seen that it is not the best men who succeed, so frequently as the ardent partisans of principles widely separated in every possible way from practical urban administration. But when we proceed to examine the acts of local government authorities, and the motives which actuate men within the council chamber, it will be found that in every parliamentary borough in the kingdom the most indifferent matters are generally decided with far too direct reference to party lines. In spite of the neutral character of the relations of a Municipality with Parliament or the Executive, it is often seen that the debates on the very relations in question are conducted on both sides in the most violent spirit of faction. We could fill columns with instances of this—from Bolton, where a "Radical minority" is credited by a local print with packing a town's meeting, and thereby ensuring the rejection of a proposed Corporation Bill; to Exeter, where, at the late election, the Conservatives, being weighted with the suspicion of favouring extravagant expenditure of the city funds, "barely succeeded in retaining their majority in the Council." But it would be waste of time to multiply instances of practices generally known, and, we hope, universally condemned. That a good party leader in a Municipality sometimes effects, by the help of a body of disciplined followers, salutary reforms which of themselves might have waited for a long time for advocates as zealous as himself, is perfectly true; but it is also certain that right and justice do not invariably appertain to the majority—especially when the majority is created without reference to the subjects on which it has to adjudicate—and therefore the same power is equally available as an instrument for evil as for good. We would fain hope that as a knowledge of what really constitutes corporate welfare spreads among the ratepayers of our towns, and as the peculiar duties and responsibilities of Urban Sanitary Authorities become more distinctly appreciated, and dignified by the example of thoughtful men to whom the care of the

health and corporate welfare of their fellow-citizens is a pursuit sufficiently honourable for its own sake, the influence of party politics will correspondingly cease to determine the constitution of Gas Committees or Water Departments, and that the time will be gone when it may be said, as at present in an important Midland town, "If we were to supply sixteen and a half candle instead of seventeen and a half candle gas, our present Liberal Council would be scattered to the winds by an indignant public, and the Conservatives would come in with a large majority!"

Dr. Siemens has written a long letter to *The Times*, in reply to Mr. Preece's communication on the subject of the danger of the electric light, to which we alluded last week. We are not concerned with the differences on electrical matters existing between those two eminent authorities; but Dr. Siemens comes more within our province when he goes on to speak of the value of gas as a heating agent, with direct reference to the present agitation on the great smoke and fog question. Dr. Siemens points out that in the case of factory furnaces there is no longer any excuse for the consumption of fuel in such a manner as to send forth smoke from the chimneys, as by the mere adoption of gas firing all smoke is not so much consumed, as entirely prevented. The veteran originator of the regenerative furnace goes on to advocate the use of gas fires upon the domestic hearth, not of the usual pattern, which may, in general terms, be described as consisting principally of fire-clay and asbestos kept in an incandescent state by a gas-flame from beneath, but in a combination of coke and gas with a solid plate substituted for a fire-grate. The gas is applied to the coke from the front, and Dr. Siemens expresses himself as thoroughly satisfied with this arrangement, which he uses in his own house. The combination is not new, having been introduced nearly thirty years ago, somewhere about the time when Dr. Siemens says he tried to get a Bill through Parliament for supplying Birmingham with heating gas, in which he failed, as he states, in consequence of the opposition offered by the local Gas Companies. We do not here wish to rake up the ashes of a controversy which terminated so long ago, especially as there is no apparent intention on Dr. Siemens's part to renew it. It may, however, be said that the failure of Dr. Siemens's efforts at that time was due to other causes than the opposition of any local competitors, although they may have led the attack on the innovation. We must regard the project of supplying a heating gas in the manner proposed as having failed in reality from its own weakness, or it would assuredly have been adopted elsewhere, though Birmingham would have none of it. In such cases as this, where two analogous processes contend for mastery, and one is victorious while the other becomes extinct in consequence of one defeat, there can be no doubt that it is the fitter which survives. Dr. Siemens, of course, could scarcely be expected to put forward these considerations, and, after all, the chief interest of his letter is to be found in the statement that he has discovered a satisfactory means of using common coal gas for the purpose of warming his residence.

Mr. Hunt and the Gas Department of Birmingham must be congratulated on having succeeded in demonstrating the effect produced when streets and open spaces are lighted by gas in a proper manner. The result, up to the present time, of Mr. Hunt's experiments with powerful gas-burners and the lanterns for use with them, has been the adoption by the gas department of Bray's burners with a globular lantern, constructed in accordance with an original design in the Corporation workshops. As our readers will see, when we publish the engraving we are having prepared to accompany the estimate, which is to be laid before the Town Council, of the cost of maintaining the lamps, the space in front of the new Council Hall selected for the inauguration of the new system of lighting is irregular in plan and contour, whereby the difficulty of satisfactorily illuminating it and of avoiding shadows is considerably increased. But the success which has attended the attempt is very complete, the whole of the roadway and side paths between the Council Hall and the Town Hall, and in the immediate neighbourhood of the recently-erected Chamberlain Memorial, being at present admirably lighted every night. The Corporation have lately made some striking improvements in this locality, and as the lanterns adopted are not entirely covered with opal glass, only the actual centre of the globular lamp being so lined inside, the buildings surrounding the favoured site of the brilliant display of the gas department are illuminated to the roof in every detail. It may be expected that the department, having entered on this course, will have some difficulty

in deciding where to stop, as a demand will certainly arise, from other and even busier quarters of the town, for similar illumination. While referring to Birmingham affairs, it may not be uninteresting to state that it is the practice of the gas department to open the works for the inspection of general visitors on certain days. Ratepayers are, on application at the gas offices, supplied with tickets to view, and are conducted over the manufacturing stations by guides, whose descriptions are supplemented by lithographed plans, with which the visitors are provided. The privilege is valued by the public, many numerous parties being shown over the works on every visiting day; and the Gas Committee probably find the education thus given to their constituents by no means wasted. This Birmingham practice might with advantage be imitated elsewhere, for if a gas consumer feels himself called upon to write to a local paper with reference to the "air-pump" which he knows is somewhere on the works, a preliminary visit with the object of finding that celebrated piece of apparatus might enlighten his mind in many ways.

We would draw the attention of those of our readers who are interested in the subject of coal carbonization to the very carefully argued communication from Mr. G. E. Stevenson, which appears in another column. The writer succeeds in placing the question in a light which should materially assist in directing observation upon the real points at issue, and appears to have carried his analysis of the problem quite as far as is useful or necessary on general principles. The next step, to bring the matter from the general down to the particular, is to apply his method of reasoning to the results given by any description of coal. It should not be difficult to interpret the results of coal analyses in accordance with the doctrines laid down so clearly by Mr. Stevenson.

An announcement made by the Secretary, Mr. W. North, at the recent meeting of the Midland Association of Gas Managers at Birmingham, respecting the formation of a medal fund, is deserving of particular notice. The fund, although only started at a Committee meeting, has already attained the respectable figure of £330, which will in all probability be much increased. The medal is to be awarded for original research in gas manufacture, and we may be allowed to express a hope that the custodians of the fund will be enabled to place and keep their medal high, among the few peculiar distinctions which are reserved for workers in the particular field in question. The circumstances under which the Birmingham medal will be awarded have yet to be determined upon, but we assume that it will be free and national in its application. The responsibility of disposing of a reward of this kind is by no means slight; one or two mistakes in the bestowal are generally sufficient to rob it of all estimation, and in that case the design of the founders is frustrated, and their contributions are wasted. On the other hand, an honourable reward is too frequently thrown away upon men who, by a taking invention or happy discovery, have become famous, and are therefore placed beyond the need of a species of encouragement they would either value lightly or use as a gratis advertisement. Between these two extremes of insufficient deserts and superfluous notoriety lies a wide space, wherein may be found many original workers, numbers of whom, perhaps, are never destined to see their labours bring them any substantial reward; they may, indeed, be patiently gathering observations, and doing unpretentious work of which others, more brilliant or more fortunate, may in time make a wonderful use. These are the men to whom a kindly recognition is of value, and it is among them that the disposers of the Birmingham medal will find the most suitable recipients of their gift.

The paper on sulphate of ammonia manufacture, read at the last meeting of the Midland Association of Gas Managers, by Mr. G. E. Stevenson, of Peterborough, was an exhaustive account of a very complete little factory for disposing of the ammoniacal liquor made at the author's works. From considerations of safety, Mr. Stevenson has been led to adopt the dilute acid system of manufacture, and in small works the difference between working with dilute and concentrated acid is perhaps not of much moment, but in some cases the use of strong acid is of very palpable advantage. Mr. Stevenson's commendable readiness to impart any information he may possess to his brother Managers is only equalled by his desire of the same treatment in return, and it is to be regretted that for lack of this reciprocity he was unable to give a comparative statement of the results of his method of working as compared with others, although some information

useful for purposes of comparison came out in the subsequent discussion. Mr. H. Woodall subsequently raised a very important question in his paper on the subject of meter-rents, and the advisability of charging specially for the use of this particular class of the necessary plant of a gas undertaking. As, however, we treat of this subject elsewhere we need not here further allude to it.

Water and Sanitary Notes.

THE present position of the Metropolitan Water Question will be found discussed at some length in another part of our columns, more especially with reference to the Government of London. We may here observe that Sir W. Harcourt refers the Vestry Delegates to the answer given by the Earl of Fife to Earl Fortescue in the House of Lords last August. This shows that the Government intend to go no further at present than the formation of the Water Authority which is to investigate the whole subject. No Bill for the purchase or regulation of the London Water Companies will be introduced by the Government during the ensuing session. Still less is it to be expected that the Government will introduce a competing scheme. This programme is much too slow for such ardent spirits as the Vestry Delegates and the Corporation of the City, and Sir W. Harcourt may find that he has raised expectations which it will be by no means easy to gratify. In the Court of Common Council on Thursday, it was referred to the Gas and Water Committee to "consider the advisability of offering a substantial premium or premiums to engineers and others, for the best plan or mode of supplying the City or the Metropolis with water." The best plan might be supposed to consist in an amalgamation, complete or partial, of the existing Water Companies, and a re-arrangement of some of the distributory works. Lieut.-Col. Bolton has a plan already prepared for the purpose, and we greatly doubt whether the Corporation will meet with anything better, supposing they decide on carrying out the idea which has been referred to the Gas and Water Committee.

Paddington is suffering from sickness attributed to two sources—mud and milk. The banks of the Grand Junction Canal are alleged to be in a highly offensive state, emitting odours which are of a most unwholesome nature, creating fevers and other maladies. Dr. Stevenson, as we mentioned last week, has traced the outbreak of scarlet fever to the importation of infected milk from two farms in Oxfordshire. The question arises whether a similar explanation is available in respect to other Metropolitan localities where the same disease is making its ravages, causing serious suffering and inconvenience among the poor. Schools are being shut up, and in several of the reported cases the means of livelihood are cut off, owing to the suspension of indoor employment, as in the case of journeymen tailors and others who have been in the habit of carrying on their work at home. That the water supply is not in fault may be inferred from the fact that the disease is rampant in a locality near the Shooter's Hill Road, where the supply is derived from the works of the Kent Company. Scarlet fever also affects the City, where the supply is from the New River, as well as Brixton, where the source is again different. Bethnal Green, Poplar, Southwark, Greenwich, and Deptford are all troubled with this infectious disease. It also shows itself in the provinces, including Sanderland, Leicester, and Oldham. In Dundee, scarlet fever has proved fatal to members of good families, residing in houses which apparently ought to be healthy. After much perplexity, the Sanitary Authorities of Dundee are said to have traced the origin of the epidemic to the milk supply, affording one more instance of the milk being found guilty where otherwise the water would probably be condemned.

The terrific floods of the last few weeks have given fresh impetus to the agitation for the creation of watershed boards. The old artificial boundaries of the counties and the boroughs are found wholly unsuited to the proper management of the rivers, and the subject is to be brought before Parliament next session by Mr. Magniac, who will introduce a Bill for the purpose, but in the hope that the Government will be thereby induced to bring in a Bill of their own. Mr. Magniac lays down the principle that the upland proprietors should contribute, though in a reduced degree, to the expenses incurred in the prevention of floods. There is much to be said in favour of this view, inasmuch as the upper districts discharge the water which floods the lowlands. The proprietors of the lowlands should contribute because they are benefited, and those of the uplands because they have originated the mischief. Such is the argument, over which there will, of course, be a struggle.

The deputation appointed by the Magistrates and Council of Glasgow to visit various towns for the purpose of discovering the best mode of dealing with the sewage that now pollutes the Clyde, have presented a long and interesting report on the subject, to which we may perhaps advert more at length on a subsequent occasion. The report recommends that the sewage of Glasgow be intercepted by means of sewers to be constructed for the purpose north and south of the river, and that the sewage should be treated by some method of intermittent precipitation before being discharged into the stream. The report suggests that steps should be taken to discourage the use of water-closets, and to limit the discharge of manufacturing refuse into the sewers. The absolute necessity of restoring the Clyde to a state of comparative purity, by some means or other, is distinctly recognized "as a matter of necessity and not of choice."

The disposal of what may be called the dry refuse of towns is attracting increased notice, especially where the population is large. Dr. Sedgwick Saunders, in a report to the City Commissioners of Sewers, states that he has been carefully watching this question for the last three years, and believes that the law will, at no distant period, interpose to prevent the treatment of town refuse in the midst of populated districts. He deems the subject so serious as to demand the immediate attention of the City authorities, and it has accordingly been referred to the Sanitary Committee for consideration. The same topic was mooted at the Limehouse District Board of Works a few days ago, when it was suggested that an apparatus like that now employed at Leeds might be made to suffice for the whole of the Tower Hamlets. We mentioned last week that the subject was already receiving the attention of the Paddington Vestry, and we may expect to hear of it from time to time in other quarters. The question at issue is analogous to the sewage problem, but happily is less difficult to deal with.

THE DANGER OF THE USE OF WATER GAS.—An American correspondent sends a copy of the *Yonker's Gazette*, of the 16th ult., with the remark: "I forward by this mail a paper marked with an account of a suffocation with our much-boasted 'Municipal water-gas.' There are many such cases here, but few that are reported in the papers." The following is the paragraph referred to:—"In the broad silk department of W. H. Copcutt and Co.'s silk factory, Nepperhan Avenue, on Friday morning, by the escaping of gas, about 15 of the employees of that room were prostrated. The morning being cloudy, the gas was lighted, and for some reason was not turned off when the lights were put out. About two hours after this one of the girls complained of feeling sick, and several others complained of severe pains in the head. The doors and windows were thrown open, and as soon as the fresh air was let in several more fell prostrate and were carried out of doors, where they partially revived, and those able were assisted to their homes and others conveyed in carriages. R. F. Roberts, foreman, and James Early of this department, succeeded in procuring physicians for those who were thus affected. Daniel Sweeney, living on Hog Hill, reached his home, when he fell prostrate. He will recover. Mrs. M. Kilgour, of Yonker's Avenue, was taken home in a carriage, and lies in a critical condition. Mary Hardley, residing near the factory, relative medical assistance, and is improving. Miss Maggie Higginbotham, of Chestnut Street, walked to her home, and immediately went into convulsions. She is improving. Mrs. M. Birch, residing on Palisade Avenue, was taken to her home in an insensible condition, and doubts of her recovery are expressed. Others were similarly, though not seriously affected."

MEETINGS OF CIVIL ENGINEERS.—The weekly meetings of the Institution will be resumed this evening, when the session will be inaugurated by the reading of a paper on "Machinery for Steel Making by the Bessemer and the Siemens Process," by Mr. Benjamin Walker, of Leeds. Accompanying the official notification of the meeting is a list of subjects for premiums, giving suggested titles for papers on various matters concerning the art of the engineer. These subjects are for the most part of the same nature as in former years, but there are some significant additions, notably on "The Action of High Winds on lofty and Exposed Structures, and the Best Methods of Determining the Force of the Wind." It is to be observed that the interest on the trust funds disposing of the Institution amounts to nearly £450 per annum, the whole of which sum is available for premiums and prizes, and with certain limitations (directed by the donors in two cases) no distinction is made in awarding the premiums between a Member of the Institution and any other person, whether a native or a foreigner. In the case of the Studentship prizes, and the Miller scholarship of £40 a year, tenable for three years, are restricted to members of this class, whose papers read at the supplemental meetings are deemed worthy of premiation. In the circular, reference is made to the Library, believed to be the most complete collection of engineering literature in existence, but which requires necessary efforts to keep it abreast of the times. Finally the members are urged to make more use of the Institution by testing the services of its officers, in the belief that advantage may thus accrue both to the individual and to the Society. Altogether there seems to be disposition and a desire to carry out, in the spirit as well as in the letter, the objects for which the Society was formed more than half a century ago—viz, the collection and diffusion of professional knowledge. In addition to the one mentioned above, the following are in the list of subjects for papers:—"On Proportioning Mains for the Distribution of Water and Gas." "The Methods of Protecting Metal Work exposed to Corrosion, with examples." "The various descriptions of Pumps employed for Raising Water or Sewage, and their relative efficiency." "The Flow of Water through Pipes and Conduits, with experiments in verification of the existing formulae, and suggested amendments and improvements." "The Mechanical Separation and Chemical Treatment of Sewage, with analyses of the effluents and of the sludge, and statements of costs in proportion to population and rateable value." "The Modes of Regulating the Action of Storm Overflow from Sewers, and the Flushing of Sewers." "The Methods used for Determining the Discharge of Rivers, with a description of the Floats and Current Meters employed for the purpose."

METER-RENTS.

The subject of the policy or impolicy, the propriety or otherwise, of charging a rent for gas-meters, is one that has often been raised in our columns. It has also at intervals been discussed at several meetings of Gas Managers, always evoking opinions as divergent as they are usually emphatic. The paper read by Mr. H. Woodall, at the recent meeting of the Midland Association of Gas Managers, which we publish to-day together with the discussion upon it, shows that the freshness has not worn off from the topic. It would also seem to show that little advance has been made towards uniformity of opinion on the subject. This want of agreement, though it is specially noticeable in reference to meter-rents, extends further; for, on the cognate questions of discounts or of a differential rate of charge according to the amount of consumption, the difference is probably quite as great. These divergences of opinion and practice are, it may be asserted, due to the adoption of different stand-points from which to regard the same question. For instance, a desire to increase the number of consumers, to simplify accounts, or to remove a source of frequent disputes, would point to the desirability of abolishing the charge for meters, although it would involve an increase in the charge for gas equivalent to the rental surrendered. The same result would follow if a gas undertaking were conducted upon what are understood generally as benevolent principles—in the interest, that is, of the small, who are assumed to be the poor, consumers. On the other hand, it is maintained, and we cannot but think with much force, that such a shifting of the burden would be unfair to other sections of the consumers at least equally deserving of consideration.

We need hardly point out that the parallel often drawn between gas-meters and measures used by tradesmen in serving other goods to their customers, is very halting and imperfect. The tradesman with a set of scales or measures serves to any number of people as much of his goods as they agree to take; the Gas Company conveys to the houses of its customers a practically unlimited supply of its commodity, to which they are at liberty to help themselves. The meters provided are assumed to be no more than sufficient for the registering of individual consumptions, and cannot possibly be applied to the measurement of any other supply. Thus a meter becomes as essential a part of the consumer's personal service as is the burner or the fitting carrying the burner. If the consumer chooses, he may provide his own meter, and in many more cases than at present this would be done, but for the well-grounded belief that it is more economical to allow the Company to do it for him.

Under the legislation which has hitherto governed Gas Companies, exclusive privileges have been granted them, because so, it has been seen, the interests of the consumers could best be served. A limited dividend has been allowed and a price has been fixed, sufficient, it has been assumed, with proper care and economy, to allow of the earning of that dividend. The large majority probably of British Gas Companies are paying the full dividends allowed, and could do so without the help of meter-rents, and yet keep within the maximum price for their gas. It is in these cases not necessary, nor a desire for larger profit, which causes the charge; but, it is fair to assume, a conviction of its justice. Neither are we aware of any occasion upon which its propriety has been questioned before a Parliamentary Committee. To the numerous Companies acting under the modern institution of the sliding scale, however—and their number is growing rapidly from year to year—the question has a far closer application, for the abolition of meter-rents would mean to them an immediate and considerable reduction of dividend, and that without conferring any real advantage on more than a section of the consumers.

The simple abolition of the charge for meters and increasing the price of gas so as to recoup the loss sustained thereby, is, we think, questionable policy. The ordinary charges for meters are equivalent to about twopence per thousand feet on the gross sale of gas, and this consequently would be the added charge upon the gas were the change made. It will be seen at once how oppressively this would weigh upon the large consumers. They, few in number comparatively, would have to bear the whole accumulated burden which previously had been much more easily borne by, and we think more equitably distributed over the shoulders of the larger class of persons whose gas consumption is, relatively to the cost of meters, smaller. This class is by no means confined to the poor occupants of small houses. There are very many meters of large size, fixed in churches and chapels, in large halls not in frequent use, and in other places, where the profit on the rental could not possibly pay for their main-

tenance and interest upon their first cost. In all such cases the abolition of meter-rents would mean the further taxing of the already more profitable consumers, as certainly as is the case in relation to the consumers as a whole in those towns where the Municipalities make large gifts out of gas profits to those who have not contributed anything towards the earning of them.

The proposal to meet the admitted hardship on the larger consumers by a differential charge for the gas, is one way of surmounting the difficulty where it is created, and it has much to recommend it. At the same time it appears to lack the absolute fairness of the charge for meters. Very large consumers may reasonably claim an abatement from the ordinary charge for gas, based upon the cost of distribution and collection, which in their case is often reduced to practically *nil*; and this is an abatement the justice and the amount of which can be readily determined. If, however, it is admitted, as we think it would have to be, that a large proportion of the consumers of a Company are made unprofitable by the abolition of the charge for meter hire, then we fail to see how any system of allowances to the larger consumers can save the latter from bearing the burden. Of course this charge makes the cost of gas higher proportionately to the small consumers, and is consequently a barrier in the way of its use, but the suggested raising of the price would be a still greater one. If the consumer burning, say, 5s. worth of gas per annum has that quantity delivered to his house at the same rate as his neighbour who consumes £50 worth, he is, in regard to that article, placed in a better position than with most other of his purchases. We think it is perfectly just and equitable that when the inevitable conditions of supply require that consumers shall have on their own premises instruments devoted to their exclusive use—pieces of plant provided for them, and proportioned as directly as possible to their individual requirements—they should bear their cost.

While holding this opinion, we would deprecate the practice, which is said to obtain in some towns, of making considerable profit out of the rental of meters. The actual cost of them is easily determinable, and this is all there can be any justification for charging. Every consumer should, so far as it is possible to secure it, contribute to the profit of the undertaking in proportion as he contributes to its rental. This principle would be abandoned altogether with the remission of the charge for meters; it would be equally violated if such charge were made excessive.

GAS LEGISLATION FOR 1880.

(Continued from p. 685.)

Eleven provincial Gas Companies obtained extensions of their previous parliamentary powers.

The *British Gaslight Company, Limited* (*Staffordshire Potteries*), Act empowers the Company to enlarge their works and to expend further capital at their Staffordshire Potteries station. Additional capital to the extent of £50,000 may be expended for the purposes of the undertaking; the previous capital expenditure having been £72,610. Of the new capital, only £40,000 is to be expended out of the capital stock of the Company, the remainder to be raised on mortgage. The dividend on the new capital is limited to five per cent., whether issued as ordinary or as preference capital; and an equal rate is the maximum permitted for interest on the new mortgage. There is no special direction as to the method of issuing the new capital. The Gas-Works Clauses Act of 1871 is incorporated with the Act. The gas supplied is to be of fourteen-candle power, and any gas examiner appointed under the General Act may prescribe the pressure at which gas is to be supplied, and may test the pressure, having power to open roads and streets for that purpose, giving two hours notice thereof to the Company. The usual provision for payment of interest on consumers deposits is inserted in the Act. The Company are to conform to the Act of 1871 in the manner of keeping their accounts.

The *Chester Gas Act* enables the Chester United Gas Company to raise additional capital to the extent of £50,000 by the issue of new ordinary or preference shares or stock of the unit value of £10, and to borrow £12,500 on mortgage in respect of the new capital, under the usual restrictions. The capital authorized by the Company's former private Acts of 1858 and 1870 amounted to £80,000 in shares, and £20,000 on loan, which has all been expended except £6000 in shares, and £2500 remaining to be borrowed. The new capital is to be issued in instalments of not more than £25,000 in the year following the passing of the Act, and £5000 in any

subsequent year; it is to be offered by auction or tender, and the premiums obtained on the sale are to be included in the gross amount authorized to be raised. The premium capital may be employed to pay off loans or for other capital purposes without dividend. The dividend on the new capital is limited to seven per cent. when issued as ordinary capital, or six per cent. for new preference capital. Payment of back dividends is to be confined to a term of three years, beyond which no such deficiency in the dividends in either of the old or new classes of capital is to be made up; provided that if the clear profits of the undertaking for three successive years shall amount to more than is required to pay the prescribed rates of dividend on the ordinary stock or shares, the corporate authorities of Chester are empowered to call upon the Company to make such a reduction in the price of their gas as, having regard to the provisions of the Gas-Works Clauses Act, 1847, with respect to the formation and appropriation of a reserve-fund, may be considered reasonable. In case of difference, the matter may be referred to arbitration, and in that case the Company have power to demand a new arbitration in the event of their profits becoming insufficient to meet the prescribed dividends. The Company are empowered to set aside out of profits a sum not exceeding one-half per cent. of their paid-up capital for the time being, for the purposes of a contingency-fund, but such fund, as accumulated, is not to exceed one-thirtieth part of the paid-up capital. Section 13 of the Chester Gas Act, 1870, is repealed in favour of a clause authorizing the appointment of a receiver by mortgages. Two ordinary general meetings of the Company are to be held in each year, in February and August respectively. Regulations as to pressure are included in the Act, as also the other provisions as to testing and quality contained in the Gas-Works Clauses Act, 1871, and the Chester Gas Act, 1858.

The *Dartford Gas Act* authorizes the Dartford Gas Company to purchase additional lands, to raise additional capital, to amalgamate with the Darenth Vale Gas Company, to extend their limits of supply, and confers other powers upon the Company. The Dartford Company were incorporated by the Dartford Gas Act, 1867, for the supply of gas in the parishes of Dartford, Wilmington, and Stone, in the county of Kent, with an original capital of £4400, and £10,000 additional capital, now all expended, and the Company have borrowed £2500 on mortgage under their Act. The unincorporated Darenth Company were registered under the Companies Act of 1862 as a limited Company, for the purpose of supplying with gas Darenth and South Darenth, Sutton-at-Hone, Horton Kirby, Farningham and Eynsford, in Kent, with a capital of £6340 in shares, and debentures to the amount of £3300. The two Companies are dissolved and re-incorporated as one by the present Act, with extended limits of supply, including the two adjacent parishes of Sallingstone and Southfleet, and are also empowered to supply gas in bulk beyond such limits. The Company take powers to sell or let on hire gas stoves and fittings. The property of the two Companies is vested in the new Company as from July 1, 1880. The authorized capital of the two Companies as they existed on Dec. 31, 1879, amounting together to £24,400, divided into £10 shares, forms the capital of the Company incorporated by the present Act. This capital is apportioned in two classes, class A comprising the original capital of £4400 of the Dartford Company, and class B including the £10,000 old additional capital of the Dartford Company, the original £6340 paid-up share capital of the Darenth Company, and £3660 uncalled capital of the same Company. This unissued capital is to be offered first to the old Shareholders of the Dartford Company. The dividend on the "A" capital is to be ten per cent., and on the "B" seven per cent. Additional capital may be raised by auction or tender to the amount of £50,000, including premiums; not more than £10,000 to be issued during the first year, and £4000 in any subsequent year after the passing of the Act. The Company are also authorized to borrow on mortgage in respect of the original capital the sum of £6100, inclusive of the Dartford Company's previous borrowing powers and the amount already borrowed by the Darenth Company; and also to borrow £12,400 in respect of the additional capital sanctioned by this Act. Dividend on new issues of ordinary capital is limited to seven per cent., and to six per cent. on preference capital. Any insufficiency of profits made during a half-yearly period is to be borne wholly by the ten per cent. capital, until it is reduced to a seven per cent. dividend, after which both classes of capital are to bear an equal share of the deficiency. The purchase-money of capital sold by auction is to be paid within one week of the sale. The price of gas is not to exceed 4s. 9d. per thousand feet in the parishes of Dartford, Wilmington, and Stone, and 5s. 6d. per

thousand feet in all other parishes within the limits of supply. The gas is to be of fourteen-candle power, supplied at pressures of six and eight tenths, as usually prescribed, and the Company are made subject to the General Act of 1871 as to testing. They are permitted to acquire five acres of additional land for the purposes of their undertaking, but not for the manufacture of gas or residual products.

The *Eastbourne Gas Act* confers further powers on the Eastbourne Gas Company for the purchase of land, the construction of works, the raising of money, and other purposes. The Company were incorporated in 1868 for the supply of gas within the town and parish of Eastbourne and the parish of Willington, with a capital of £50,000, and power to borrow £12,500; the whole of which has been raised and expended. By the present Act the limits of supply are extended to include the parishes of Westham and Pevensay. The Company are authorized by it to raise additional capital amounting to £150,000 (including premiums), in any of the usual forms, of £10 unit value. Not more than £30,000 of this new capital is to be issued during the first year, nor more than £20,000 in any subsequent year after the passing of the Act. Provision is made for borrowing on mortgage £37,500 in respect of the new capital. Dividend on new ordinary capital is limited to seven per cent., and to six per cent. on preference capital; and except otherwise provided at the time, no holder of any new preferential shares is to have a vote in respect of the same. Any deficiency of dividend is in future to be borne proportionately by all the different classes of stock or shares. The auction clauses are enforced, and the sliding scale is also imposed with an initial price of 4s. 4d. per thousand cubic feet. If the profits of the undertaking in any year exceed the amount required for meeting maximum dividends, an insurance-fund may be founded, with an appropriation of not more than one per cent. on the paid-up capital, until the fund amounts to one-twentieth of such paid-up capital. A reserve-fund is also permitted when the standard rates of dividend are increased under the sliding scale. Lands described in the schedule may be taken within three years by the Company for all the purposes of their undertaking, under certain conditions stipulated for the protection of parties. The Company take power to sell or let gas stoves, &c., and to take licences for using any patented or other invention in connection with the business carried on by them. The testing of the pressure and illuminating power of the Company's gas is to be in the manner prescribed by the General Act of 1871.

The *Lincoln Gaslight and Coke Company's Act* enables the Company principally to raise additional capital. The Company were incorporated in 1828 with a capital of £8000 and borrowing powers up to £2000, and by another Act in 1873 their powers were enlarged, and they were authorized to raise £20,000 additional capital and to borrow £20,000 on mortgage, and also to create improvement stock to the amount of £36,500, to be issued as fully paid-up stock, and distributed among the holders of the original share capital, the whole of which capital powers have been exercised, and £2000 has been borrowed but repaid. The dividend on the Company's original capital was limited to ten per cent., and to seven per cent. on the additional ordinary capital, and six per cent. on the new preference capital. The Company raised the £20,000 which their 1873 Act had permitted them to borrow, in the form of preference capital at five per cent. interest, instead of by mortgage. By the present Act the capital of the Company is defined to consist of £104,500—comprising original "A" stock, amounting to £8000; the additional stock of 1873, amounting to £20,000; capital "B" stock to the amount of £36,500; and new stock of 1880 to the amount of £40,000—with fresh borrowing powers to the amount of £10,000. The new stock is to bear interest at the rate of seven per cent., and to be raised by auction or tender. Not more than £10,000 of the new stock is to be issued yearly. All classes of stock are to bear proportionately any reduction of dividend that may occur. Certain of the sections of the Acts of 1828 and 1873, relative to voting, are repealed, and clauses are inserted giving Proprietors a vote for every £50 stock up to £500, and another vote for every £250 up to £5000, and a further extra vote for every £500 held over £5000. Power is also given for granting a pension to the present Manager of the Company, by consent of three-fifths of the votes of the Proprietors present at any general meeting.

The *Liverpool United Gaslight Company's Act* enables the Company to erect additional works and to extend their limits of supply. The Act incorporates the Gas-Works Clauses Act, 1871, with the reservation of certain clauses in the Company's Acts of 1848 and 1865, which affect the Corporation

of Liverpool, and, as to the latter Act, also concerning the illuminating power of the gas and the testing-place. The usual stipulation as to pressure is also inserted. The Company are empowered to manufacture and store gas on certain lands, having an area of about fourteen acres, adjacent to their Linacre works. The limits of supply are also extended to include the township of Orrell-and-Ford, in the parish of Sefton, Lancashire.

(To be continued.)

THE GOVERNMENT OF LONDON IN RELATION TO THE WATER SUPPLY.

AN article by Mr. W. McCullagh Torrens, M.P., on "The Government of London," in the current number of the *Nineteenth Century*, helps to show how intimate is the relation between two prominent questions affecting the Metropolis. We have long contended that if ever the Water Companies were superseded, the Metropolitan Board and the Vestries would be likely to undergo a still more summary dismissal. Mr. Torrens clearly foresees the critical issues bound up with the water question, and is filled with apprehension lest the present excitement on that subject should lead to untoward results in respect to the local government of the Metropolis. But while there is fear on the one hand, there is hope on the other, and the member for Finsbury indulges the expectation that matters may take such a turn as to hasten that perfect municipal organization for which he has so long sighed and sought. His fear is that a bureaucratic party will know its opportunity, and will seek to bring into existence "a sub-department of the Local Government Board, with a certain number of Water Trustees elected for 'form's sake by the people, like poor-law guardians, to come" when summoned, sign their names in a book, listen to "orders, and go home again; leaving the whole direction "and management of another great branch of local taxation "to the Government of the day." With so much to fear, Mr. Torrens nevertheless asks "whether a central Water Trust, elected in name or reality, must not be regarded as "the first story of a unified municipal edifice for the whole of London."

It is not altogether easy to understand Mr. McCullagh Torrens. We question whether he quite understands himself in regard to the problem which rises up before him. He clings tenaciously to his theory of the "ten cities" on the banks of the Thames, the said cities constituting what is commonly called London. For each of these cities or towns he desires to secure distinct municipal powers. How these ten towns are to deal with the water supply as furnished by eight Water Companies is a species of dissected puzzle which Mr. Torrens seems rather at a loss to put properly together. The territory of the Companies extends outside the Metropolis, and the boundaries of the water districts in no case coincide with those of the so-called "cities." The necessity of one central body to deal with the whole is evident. But Mr. Torrens is far from being happy when he contemplates the possibility of such a power being created. When discussing this question nearly a year ago in *Macmillan's Magazine*, he contended: "If Lambeth or Southwark is dissatisfied with 'its supply of water, by all means let Lambeth or Southwark have the power to take care of itself in this respect, either by compelling the existing Company to 'serve it with a better article, or to secure that service 'by other means.' Again, 'If Marylebone or Hackney is 'satisfied with the quality furnished, why not let it save 'the enormous outlay requisite for buying up the goodwill 'of the existing service, and devising another to be supplied 'from afar?' The answer to these queries is obviously found in the utter impossibility of making such a scheme work. It is perfectly true that there is a wide diversity between the local characteristics of various parts of London. What is there in common between Bermondsey and Belgravia, or Whitechapel and Chelsea? The contrast is great, and the same species of diversity may be traced among numerous other localities. Yet, after all, there are some things in which all London has a common interest, and in which there must be united action. Whatever defects may exist in the Metropolis Local Management Act, there is a principle recognized in that statute which cannot be overthrown. Thus, there is a proper distinction between interests which are local and those which are metropolitan. For the former we have the Vestries and District Boards, and for the latter the Metropolitan Board itself. Even the City, despite its antiquity and its wealth, is treated under the Metropolis Local Management Act very much as a District Board of Works.

The difference between the sectional and the general

interests of London cannot be ignored. At the present time the Vestries and District Boards, moved by a common interest, are meeting together to consider the question of the London Water Supply. The Metropolitan Board is unable to take any action in the matter, but the Vestries feel that there is a sort of anomaly in leaving the Imperial Government to deal with the subject without any consultation with the Local Authorities. They want to know what the Government is going to do, and the Home Secretary tells them, in effect, that if they wait they will see. Anxious to dispose of the Water Companies, the Vestries begin to reflect whether they may not themselves be improved off the face of the earth. They have therefore settled down to consider what should be the constitution of the Water Trust. As we have intimated on many previous occasions, the first step specified by the Select Committee on London Water Supply was the creation of a "Water Authority," which would be in reality a kind of substitute for a Royal Commission. That such a body would recommend that the water supply be placed at its disposal is, of course, a very likely result. But the creation of an "Authority" to investigate appears a very odd mode of proceeding, and very few people seem capable of grasping the idea. But supposing that somehow or other the water supply gets into the hands of a central body, the question arises—how is that body to be constituted? On this point the Select Committee have made a proposal. The Vestry Delegates, at their meeting on Wednesday last, debated the point, and the idea was mooted that possibly the water supply would be handed over to an authority which would care nothing at all about the Vestries, and not very much about the ratepayers. Hence it was argued that the Metropolitan Board should have an increased number of members, so that the Board might be strong enough to deal with the mass of details connected with the supply of water to a population of four millions of people. What will be the final opinion of the Vestries on this point is not yet apparent, but a report on the subject, drawn up by a Sub-Committee, is to be laid before a meeting of the Delegates to-morrow. In the meantime a further communication has been received from the Home Secretary, in the form of a letter addressed to Mr. James Beal, which lets in a little light on the subject, though in a somewhat indirect manner. Pressed by Mr. Beal for some useful information as to the intentions of the Legislature concerning the water supply, Sir W. Harcourt replies, through his Assistant-Secretary, Mr. Godfrey Lushington, referring Mr. Beal to "the answer given by the Earl of Fife "on the part of the Government, in the House of Lords, on "the 16th of August last, in reply to a question on the same "subject." This answer was given in reply to an interpellation from Earl Fortescue, and the latter part of it ran thus: "The Committee of the House of Commons which sat upon "the whole question of the Water Supply of London, recommended that an independent Water Authority should be "constituted, with adequate powers to deal with the whole "matter, and it is the intention of the Government to give effect "to the recommendations of that Committee." We may take this, therefore, as Sir W. Harcourt's answer to the Delegates, and the outlook is exactly what we inferred from the first. The whole question is to be shelved on to the shoulders of a Water Authority, that the latter may investigate the subject in its various bearings preliminary to coming before Parliament with such a scheme as the said Authority may deem advisable, whether of regulation, or purchase, or otherwise.

With this latest reply before them, the Delegates at their ensuing meeting may conclude that they are not particularly wanted at the present juncture. Sir W. Harcourt has had enough of the water question, pending the further action which is to take place at some indefinite period in the future. The appointment of the Water Authority is a playful demonstration, and all that follows may be left to take care of itself. Probably the Delegates will have other thoughts. In their eagerness they will look forward to the creation of the Water Trust, and already they seem to see that sublime body taking possession of the undertakings of the Metropolitan Water Companies. In considering how that body is to be constituted, we may presume that for their own sakes the Vestries will be loyal to the Metropolitan Board. If the water supply is to be transferred from the Companies, the Vestries would like to see it in the hands of the central body which they themselves create. The forthcoming Water Trust is a Red Spectre. The Delegates dread it, and will be the more afraid of it as it comes nearer to them. Mr. Torrens is half afraid of it, as likely to be fatal to the independence of the "ten cities." In fact the member for Finsbury is almost falling in love with the Water Companies, for although they are not ten, they are eight, and that is better than if they were one.

For our own part we have very little regard for the ten towns theory, neither are we quite content with the fact that there are as many as eight Water Companies in London. Economy would suggest amalgamation, and Lieut.-Col. Bolton has pretty clearly shown what may be gained in this way. Mr. Torrens has no expectation that there would be any saving in the unification of the Companies under a Government Board. He may be right to a certain extent; but experience in reference to the gas question shows that amalgamation among the Companies results in a cheaper supply to the consumer. Mr. Torrens does well in pointing out the danger of what would be practically a Government monopoly. At the same time it would be impossible for the Metropolitan Board to take charge of the entire Water Supply of the Metropolis. The work is enough for one body constituted for the purpose, and if ever the Water Companies are to be got rid of, it is tolerably certain that a special authority will be created in their room; or else a very great change will have to be made in the authorities that now exist.

While Mr. Torrens would have ten municipalities, Mr. Firth would have but one. Thus great is the difference between Finsbury and Chelsea. Mr. Firth, we think, must know but very little of what has to be done to keep London in order, when he contends that the various powers residing in the Vestries "would be better exercised by a single central authority." If this were possible, it would be equally practicable for the Metropolitan Board to take charge of the entire Water Supply of London. But everybody who has a practical knowledge of the question must be convinced that the Metropolitan Board could not possibly add to its own work that of the Vestries, nor yet that of the Water Companies. As the subject advances, this will become more and more apparent. If the Water Companies are to be superseded, a new authority must come into existence, or else the system of local government already established in the Metropolis must be revolutionized. Mr. Torrens admits that it would be easy, "were it thought" "politic, to create another Central Board by way of election, "to whom might be confided the absolute control and "guidance in all matters connected with water consumption "and water supply." But he is opposed to any such plan, though he utterly fails to show how his ten municipalities would be able to manage the water supply, whether as regulating the Water Companies or taking their place. Mr. Torrens, we observe, is by no means desirous of seeing the London Water Companies swept away, and he says a good many pleasant things concerning them. We take his commendations for what they are worth, but we point to his testimony as showing how much is involved in the question of water supply. When writing in *Macmillan's Magazine* last December, Mr. Torrens was less favourably disposed towards the London Water Companies than we find him to be in his present article in the *Nineteenth Century*. The sign thus given is obvious. The outcry raised against the Water Companies is likely to be turned to account in dealing with the local institutions of the Metropolis. The Metropolitan Board, invested with certain controlling powers over the Water Companies, has failed to exercise those powers. It savours of retribution when we find the Vestries shrinking from the notion of a Water Trust, and Mr. Torrens trembling for the autonomy of the "Ten Cities of the Thames."

Mr. G. HENDERSON, Chairman of the Plymouth Gas Company, is about to be placed on the Commission of the Peace for the borough of Bodmin.

In connection with the recent discussion that has taken place in regard to the Employers Liability Act of last session, we notice among the joint-stock companies recently formed that the "Employers Liability Assurance Corporation"—which was registered on the 25th ult., with a capital of £1,000,000 in 250 shares—proposes "to assure principals and employers against liability arising from injury, damage, or loss occasioned by their agents, servants, workmen, and other employees; also to assure against accidents and damage caused by fire, explosion, lightning, or inundation."

PROPOSED PURCHASE OF THE COLNE WATER-WORKS BY THE LOCAL BOARD.—A meeting of the owners and ratepayers of Colne, called on the motion of the Chairman of the Local Board, was held on Thursday, the 28th ult., for the purpose of getting the sanction of the ratepayers to the purchase by the Local Board of the Colne Water-Works, and of considering the advisability of applying to Parliament for powers to effect this and sundry other improvements in the town. The following resolution, on the motion of Mr. Hudson, seconded by Mr. W. Varley, was passed with only 8 dissentients:—"That this meeting of owners of property and ratepayers of the district of Colne and Marsden, in the county of Lancaster, do consent to the promotion by the Local Board of the said district of a Bill to confirm and carry into effect the purchase by the Local Board of the Colne Water-Works; to empower the Local Board to construct additional water-works, to make sewerage works, and to purchase lands for the treatment of sewage; to establish a market, to erect a market house and buildings; to make new streets and street improvements, to declare certain streets and places public highways; and to borrow money to carry out these improvements." It was stated by the Chairman of the Board (Mr. T. T. England) that the purchase-money would amount to £13,500.

Communicated Article.

THE TRUE BASIS OF CALCULATION FOR ESTIMATING ECONOMY IN CARBONIZATION.

By Mr. G. ERNEST STEVENSON,
Engineer of the Peterborough Gas-Works.

In dealing with this subject, it is imperative that all personal considerations be put on one side, if the purpose be to obtain a correct and impartial view of the question. It is quite possible for two individual managers of gas-works to adopt different principles of action in regard to carbonization, and yet for both to be pursuing the policy which will, in accordance with the circumstances in which each is placed, be productive of the greatest economy to the undertakings of which they have the management. For this reason men holding prominent positions in gas management need to exercise care in advocating one line of action, and depreciating another, lest by so doing they mislead some whose true policy differs from theirs, according to the different circumstances under which they are placed.

In the first place, in order to avoid falling into erroneous principles of calculation, it is necessary to have a clear view as to what are the fixed and what the variable quantities with which we have to deal. The gas sold is the first and most important factor, and if reduced to the 1000 cubic feet standard, for which a certain definite price is obtained, forms a firm and immovable foundation upon which to base the calculation of profit, this being practically the difference between the amount received per 1000 feet of gas, and the amount paid away in manufacturing 1000 feet of gas, and supplying it to the purchaser. Hence all calculations of saving effected must be finally based on the 1000 feet of gas sold, not on the ton of coal carbonized. This latter basis of calculation is useful as a rough-and-ready one for retort-house work generally, but may lead to very fallacious results if used to determine the question of economy where such marginal saving is considered as that derived from the manufacture of an extra 500 feet of gas per ton of coal carbonized.

The second important factor is the coal used. This we must consider in relation to its cost per 1000 feet of gas produced or sold, and not as the standard unit to which other expenses are to be reduced. Looking at it from this point of view, we shall readily perceive that the greater the cost of the coal in proportion to the other items of expenditure, the more important it becomes to effect a reduction in the quantity of coal used to produce a certain quantity of gas. Thus, for instance, if the cost of the coal were 20s. per ton, nothing would be lost by adding 1s. per ton to its cost for canal, and at the same time producing 10,500 feet instead of 10,000 feet per ton of the same candle gas. The cost of coal per 1000 feet of gas produced being in this case 2s., we should be investing 1s. in raw material to produce in return one shilling's worth of the manufactured article. The only doubtful point left to be decided would be the gain by the reduction in the cost of labour, wear and tear, and interest on plant, as against the loss by reduction in the receipts for residuals. If, however, the cost of coal be 10s. per ton instead of 20s., the extra cost for canal must not exceed 6d. a ton all round, otherwise a loss will be sustained on the gross cost of the coal.

Having, then, first to deal with the coal, let us consider what is to be got out of it by distillation, and how the proportions of the different products may be expected to vary according to the conditions under which the coal is distilled. Leaving out of the question the small quantity of atmospheric air which is introduced into the retorts along with the coal in charging them, it is evident we cannot get more out of the retorts, weight for weight, than we put in. Out of 2240 lbs. of coal, no more than 2240 lbs. of gas, coke, tar, and ammoniacal liquor, taken together, can be realized. In practical working not so much is accounted for, but we need not, at the present time, consider the loss. Supposing a ton of coal to produce 10,000 feet of gas, the weight of the various products will be approximately as follows:—

10,000 cubic feet of gas, at 37 lbs. per 1000 . . .	370 lbs.
Coke	1465 "
Tar (10½ gallons)	129 "
Liquor (25 gallons)	276 "

2240 lbs.

If 10,500 feet be produced from the ton of coal there will be an increased weight of gas, and a proportionate diminution in the weight of some other products. The reduction of weight in residuals to balance the increased production of gas will amount approximately to 18 lbs. In the absence of experimental records determining the proportion in which the coke and tar are to be debited with this reduction, it may, without risk of serious error, be equally divided between the two, the loss of tar in this case amounting to ½ gallon, from which it would appear that Mr. G. Livesey is not far wrong in deducting 1 gallon of tar for 500 feet of gas. We should then get approximately as follows:—

10,500 cubic feet of gas, at 37 lbs. per 1000 . . .	388 lbs.
Coke	1456 "
Tar (10 gallons)	120 "
Liquor (25 gallons)	276 "

2240 lbs.

Having, then, ascertained roughly the variation which will take place in the quantities of the different products, let us apply the two conditions of manufacture to the production of a certain fixed quantity of gas, and see what is the gain or otherwise per 1000 feet produced. It will not do to calculate directly upon the increased yield of gas per ton, for the reason that in supplying gas to the consumer, we have not the power to sell whatever quantity

of gas we are able to produce out of a given quantity of coal. Our business, on the contrary, is to supply a given quantity of gas, and to use as much coal as is necessary to produce that quantity. Hence it is a fallacy to take credit for 500 feet more gas per ton at the selling price of the gas, for, commercially, the true position of affairs is not that we sell so much gas per ton of coal, but that we use so much coal in producing the 1000 feet of gas which we sell. If, for instance, 10,000 feet of gas be sold per ton of coal, and the coal costs 14s. per ton, while the price of gas is 4s. per 1000 feet, then we expend 14s. in obtaining a return of 40s.; if only 9500 feet per ton be sold, then to sell 10,000 feet for which 40s. is received, we must use 1 ton 1 cwt. and nearly 6 lbs. of coal, which at 14s. per ton will cost roughly 14s. 9d. The saving effected is therefore not 2s., the selling price of 500 feet of gas, but 9d., as the reduced cost of the coal required to produce the sale of 10,000 feet of gas, and is equal to a saving of 0.9d. per 1000 feet sold.

To appreciate all the points in which a saving or a loss results from an increased yield of gas per ton, it is necessary to take a sufficiently large quantity of gas as the basis of calculation, and, from the cost of manufacturing this definite quantity, calculate the cost per 1000 feet. The following estimates of the cost of manufacturing 1 million feet of gas in 24 hours will, it is thought, be regarded as fairly correct. In the one case it is assumed that moderate heats are used and 10,000 feet produced to the ton; in the other, high heats are adopted, and the yield of gas is 10,500 feet to the ton. The use of canal in these two instances is assumed to be unnecessary.

Estimate for 1 million feet of gas per diem, the make being 10,000 feet to the ton, the heats moderate, and the charges of six hours duration:—Coal carbonized = 100 tons; 28 settings of single retorts (7 each), or 14 of "throughs," will be required, and the charges of coal will be 2 cwt. each. The make of gas per mouthpiece will be 5000 feet per diem; 18 stokers will be required on each shift, or 36 in all. The furnaces will consume 16 cwt. of coke each in 24 hours:—

100 tons of coal at 14s.	£70 0 0
Deduct residuals, as follows:—	
Coke produced . . . 65 8	
Coke used as fuel . . . 28 8	
43 tons of coke, at 12s.	£25 16 0
1076 gallons of tar, at 2d.	8 18 0
2500 gallons of 10-oz. liquor, at 60s. per 1000 gallons	7 10 0
	42 4 0
Net cost of the coal	£27 16 0
36 stokers, at 4s. per day	7 4 0
Net cost of manufacture	£35 0 0
or 8.40d. per 1000 feet.	

Estimate for 1 million feet of gas per diem, the make being 10,500 feet to the ton, the heats high, and the charges of four hours duration:—Coal carbonized = 95 tons 5 cwt.; 22 settings of single retorts (7 each), or 11 "throughs," will be required, and the charges of coal will be 2 cwt. each. The make of gas per mouthpiece will be 5500 feet of gas per diem; 15 stokers will be required on each shift, or 30 in all. The furnaces will consume 18 cwt. of coke each in 24 hours:—

95 tons 5 cwt. of coal, at 14s.	£66 10 0
Deduct residuals, as follows:—	
Coke produced 61 18	
Less fuel used 19 6	
42 tons 12 cwt. of coke, at 12s.	£25 11 0
950 gallons of tar, at 2d.	7 18 0
2250 gallons of 10-oz. liquor, at 60s. per 1000 gallons	6 16 0
	40 5 0
Net cost of the coal	£26 5 0
30 stokers, at 4s. per day	6 0 0
Net cost of manufacture	£32 5 0
or 7.74d. per 1000 feet.	

These statements, if approximately correct, show that, with coal at 14s. per ton, by making 500 feet more gas to the ton, obtained by the adoption of high heats and short light charges, a gain of £2 15s. per million feet may be realized, which is equal in gas-works of the supposed size, making 200 millions a year, to £550 per annum, without allowing for saving in wear and tear and interest on plant.

If it be said that 10,500 of gas per ton is too high a yield to allow for without the use of canal, the reply is that this depends upon the circumstances of the case, upon the kind of coal employed, the illuminating power required, and also, to some extent, upon the condensing and other apparatus in use on the works. If the increase be from 9500 to 10,000 feet to the ton, the proportionate gain is greater, the 500 feet in this case being an increase of 1.19th instead of 1.20th. In most cases perhaps more than 10,000 feet per ton cannot safely be obtained without having recourse to canal. The percentage of canal necessary to maintain a certain illuminating power with a given make per ton is a fit subject for careful experiment, such as it is presumed Mr. Livesey intends to carry out.

The following estimate for 1 million feet of gas with an average make of 10,500 feet is based on the assumption that 5 per cent. of Wigan canal, at 28s. per ton, is required to maintain the illuminating power:—

90 tons 10 cwt. of coal, at 14s.	£63 7 0
4 " 15 " canal, at 28s.	6 13 0
95 tons 5 cwt.	£70 0 0
Deduct residuals as in Example II.	40 5 0
	£29 15 0
Wages of 30 stokers	6 0 0
	£35 15 0

The gross cost of the coal is in this case exactly the same as in the first estimate. There is a saving in labour of about 2d. per ton, but this does not compensate for the loss in the receipts for residuals, and the balance is 15s. on the wrong side for 1 million feet of gas. There will, however, be a saving in wear and tear, although to what extent the writer is not prepared to state; but as the saving in plant with the use of high heats is 20 per cent., it would be absurd to suppose the wear and tear of the retorts to increase in the same proportion. In fact, a very much less increase in the productive capacity of the retorts has, in the writer's experience, resulted in a saving under this head, and the fears entertained by some on the score of the expense of renewing the retorts seems quite unintelligible. Under the head of interest on plant a saving of 20 per cent. will be gained, not 5 per cent., as Mr. Livesey calculates, for it is not in proportion to the increased make per ton, but to the productive power of the retorts that a saving in this direction is to be looked for. Assuming a retort-house and retorts complete capable of making 1 million feet of gas per day, to cost £10,000, we shall have a saving of £2000 in capital, equal at 10 per cent. interest to £200 per annum.

It will be seen that so long as an increased yield of gas per ton does not necessitate an increase in the cost of the coal, by the addition of canal, it will always pay to work with high heats, and obtain a large yield of gas per ton, unless, indeed, the value of the residuals were to exceed the cost of the coal; but so long as these only defray a portion of the cost of the coal, a saving in the coal must be identical with a saving in the cost price of the gas, on the principle that the value of the whole is greater than the value of a part. The selling price of the gas has, however, nothing whatever to do with the question, it being one of cost of production alone.

It is very much to be desired that careful experiments should be made to determine what coals will bear distillation at a high heat and produce a large yield of gas per ton with economy. In this direction information is wanted. The economical limit of production will, without doubt, vary with the different quality of the coal, and it is to the quality and cost of the coal that we must look for guidance in deciding the policy to be adopted in carbonization. Increased consumption of fuel, cost of wear and tear, and other evils, may be attendant on the adoption of high heats, but are not necessarily so. An increase of fuel for each retort furnace may take place, but may work out at a less percentage on the coal carbonized by getting additional work out of the retorts, and wear and tear, even if costing more per ton of coal, will not necessarily work out at an increased cost per 1000 feet of gas produced.

This, then, is the true basis of calculation: The net cost per thousand feet of gas. To this standard all profit and loss must be eventually reduced. It is a strange inconsistency which gives credit for the production of more gas per ton of coal, and consequently the use of less coal per unit of gas, and at the same time lays the burden of the expenses upon the coal, of which there is necessarily a smaller quantity over which to spread the cost of manufacture.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE ECONOMY OF CARBONIZATION.

SIR,—I am not anxious to prolong this controversy, and shall not, therefore, after this letter, trespass upon your space, unless it should be absolutely necessary to do so.

It appears from the letters that have been written upon the subject, that the supposed advantage of a high make of gas per ton of coal carbonized is not based on any actual experiments—no one seems to know how much the illuminating power is reduced by an increase of 5 per cent. in the volume of gas made; or the difference in the tar, either as to quantity or quality; or what extra amount of fuel is required; or whether higher heats produce a gas containing more carbonic oxide and the troublesome sulphur compounds, though this also is suspected. But it has been shown, I think, very clearly, that, whatever may be the exact cost or loss incurred by increasing the make from 9500 to 10,300 feet of gas per ton, the additional 500 feet is not worth what it costs. On this point Mr. Gandon's calculation is valuable and interesting, arriving at the same conclusion from an entirely distinct method of stating the case.

As the selling price of the gas is sometimes taken as the basis of the calculation, the following explanation may be useful:—Taking the case published a week or two ago, where, in order to make 10,300 feet of gas per ton, 6 per cent. of canal is required to keep up the illuminating power—this canal raising the price of the coals 1s. per ton all round—the gain is stated as follows:—

The selling price of 500 feet of gas	2s. 0d.
Saving in labour	0 4

or a gain of 1s. 4d. per ton.

The 4d. surely must be struck out, for it cannot cost 4d. less for labour to make 10,300 feet from a ton than 9800. The labour is expended upon the coal, and not upon the gas; the most, therefore, that can be claimed is that 10,300 feet can be produced at the same cost for retort-house labour as 9800 feet from a ton. If the extra gas is made, there can be no reduction in the amount paid for labour; but if the total quantity of gas remains the same while the quantity of coals is reduced, the saving on labour will be effected.

The effect of increasing the make per ton is really to reduce the quantity of coals used, as is the case when the leakage or unaccounted-for gas is reduced.

The total quantity of gas made must be governed by the consumption. Suppose, therefore, that 980,000 feet a day be required in the gas

holders, it would (at 9500 feet per ton) be produced by 100 tons of coal. Then let the make per ton be increased to 10,300 feet—producing from the 100 tons 1,030,000, or 50,000 feet beyond the requirement—the manager would at once reduce the quantity of coal by 5 tons, thereby saving 5 tons of coal and the labour that would be expended upon them, a trifle in interest on plant, and no more.

The ordinary coals without cannel cost, say 13s. 3d. per ton; deduct from this the value of the products, which should be at least 50 per cent., but say 40 per cent., or 5s. 3d., leaving 8s. as the net cost of coal, we then have—

5 tons of coal saved, at 8s. per ton	£2 0
Carbonizing labour on the same, according to Mr. Field	0 15
	<hr/> £2 15

Cost at which this saving is effected, 1s. per ton on 100 tons, or an addition of 124 per cent. to the net cost of the coal all round for 5 per cent. increase of gas	5 0
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Loss £2 5

Without taking into account the extra loss on tar, wear and tear, &c., which greatly exceed the saving of interest on plant, it appears, if this method of stating the case is correct, that the extra 500 feet costs about double what it is worth. In other words, 1s. is paid to obtain a return of about 6d. Are any experiments really required after this?

GEORGE LIVESEY.

South Metropolitan Gas Company,
589, Old Kent Road, S.E., Nov. 6, 1880.

SIR.—The article from the pen of Mr. Livesey, on the "Carbonization of Coal," is one which brings to light an old subject, which has been laid aside as impenetrable. Why it should be so, never very clearly appeared to me; there surely must be some guide for the uninitiated—some plan for converting the poor benighted gas manager, who is "gingering his pate over the furnaces," and who, perhaps, has succeeded in obtaining the much-coveted 10,300 cubic feet of gas per ton of coal carbonized. If he has been working on a wrong basis, it is a pity so much valuable force should be either wasted or misapplied, for it must be admitted that to take 10,300 cubic feet of gas from a ton of Newcastle coal, both the manager and the man must bring to bear considerable exertion and physical application.

I am one of those peculiar individuals who have sprung from beyond the Tweed; and it is a fact that Scotchmen are great lovers of high heats, and believing that there is something fascinating about them, I hitherto have joined in chorus with my fellow-countrymen. But it is a very poor argument that one uses high heats simply because "so-and-so" does; rather bear in mind Mr. Stevenson's remark: "There should be a reason for everything;" and I so believe there is a reason for using high heats under certain conditions.

Reducing the question to one of figures, we will see how the case stands in regard to Bury St. Edmund's; and to facilitate the working out of the percentages, I have converted tons into pounds:—

Comparison.

22400 lbs. Newcastle coal, producing 9800 cubic feet of gas at a cost of	17s. 0d.
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21616 lbs. Newcastle coal, producing, at the rate of 10,300 cubic feet of gas per ton	9,939 cub. ft.
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784 lbs. cannel, producing at the rate of 12,500 cubic feet of gas per ton	437 "
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22400 lbs. of the mixture, producing	10,376 cub. ft.
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Cost of the above.

21616 lbs. of coal, at 17s. per ton	16s. 4d.
---	----------

784 lbs. of cannel, at 40s. per ton, nearly	1 5
---	-----

22400 lbs. of the mixture costs	17s. 9d.
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We have here a difference of 9d. per ton, to which add 2d. for the diminished value of the coke, and this gives us the first item in Mr. Livesey's estimate 0s. 11d.

Extra fuel 0 2

Less tar produced 0 0

Increased wear and tear of retorts and trouble with stopped pipes 0 1

Deduct, as Mr. Livesey does	1s. 2d.
	<hr/> 3d.

Difference	0s. 11d.
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To produce 576 cubic feet extra per ton of coal costs 11d., and this quantity, less leakage (say 10 per cent.), is passed on to the consumers, yielding (at 4s. 2d. per 1000 feet), say, 2s. 1d.

The above is the extent to which we should be affected here; but is it not possible that the position of the gas-works may alter the case? For example, if we take a gas-works in the North, not very distant from the coal-fields, the case would then stand something like the following:—

Comparison.

22400 lbs. of common coal, producing 9800 cubic feet of gas, cost say	8s. 0d.
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21616 lbs. of coal, at the rate of 8s. per ton	7 8
--	-----

784 lbs. of cannel, at the rate of, say, 40s. per ton 1 0	1 0
---	-----

22400 lbs. of the mixture costs	8s. 9d.
---	---------

Applying the same figures as before, we shall have a difference of 11d. per ton, which will realize from the consumer (gas at, say, 2s. 6d. per 1000 feet) say 1s. 3d.

In the former case a clear gain of 1s. 2d. was shown, in the latter only 4d. per ton; thus reducing the margin of profit to a very narrow limit indeed. This, in my opinion, is how every gas manager ought to

settle the question. Let him work it out, bearing in mind the circumstances under which he is placed, and no doubt he will arrive at the proper decision.

You will observe that I make no allowance for reduction in the quantity of tar produced; there may be a slight decline in quality, but I do not think in quantity.

From the foregoing it will be seen that high heats act differently on the exchequer according to the position in which the works are situated. They are, therefore, not to be blindly applauded, neither are they to be entirely condemned.

It is strange, however, that in nearly all cases where a gas company's business or finances have got into a low state, it may easily be traced to low heats or mismanagement in the retort-house. I never heard of a case where high heats caused disaster or deficiency.

But ought there to be such a thing as "competition" "in make of gas per ton"? I think not, for any man who, merely for the sake of surpassing a brother in the profession, strives—fairly or unfairly—to obtain a greater quantity of gas per ton of coal, is seeking after popularity in a manner which cannot be too severely condemned. And, if it is the case that any one is stupidly satisfied that he is having a great make of gas per ton, when all the time he is using more coal than appears in his carbonizing box (and which accounts for his grand make, he is a fool to begin with, and must be shutting his eyes to the best interests of the company he professes to serve. I think it would be wise in all cases to ascertain exactly the stock of coal, both at the beginning and end of the financial year; if for no other purpose than to be a check on weighing the coal into the retort-house. Many gas managers lapse into a state of indifference regarding this and other items in their working accounts, contenting themselves with the miserable assurance that because their works are small the results are "good enough." There could not be a greater mistake. What is necessary in the largest works is necessary in all works; the one principle applies in every case, and the only difference is one of degree.

I, with many others, shall look with interest for the result of Mr. Livesey's experiments, knowing, as every one does, that what this gentleman puts his hand to do he will do thoroughly.

Bury St. Edmund's Gas-Works, Oct. 30, 1880.

JOHN M'CAE.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

FRIDAY, NOV. 5.

(Before Vice-Chancellor HALL.)

IN re St. PETERSBURG NEW-WATERWORKS COMPANY, LIMITED.

MR. CHANCERY MASTER Q.C., appeared in this case, and examined his lordship that the petition had stood over on the 23rd of July last, it being a petition by a creditor to wind up the Company. The Company, he said, was a good one; but was short of funds, and the parties contemplated a resuscitation upon terms which would enable the debenture holders to have fresh debentures. The Company had undertaken not to consent to any order to wind up between July last and the present time. A scheme had now nearly been matured for the reconstruction of the Company, and it was desired, therefore, to take a winding-up order, and appoint for liquidators Messrs. Guinness and Western, who were two members of the committee of debenture holders. A resolution was passed, and an application would be made under the Act for the sanction of the Court to hold a meeting, which no doubt would result in a scheme that the Court would approve. He, therefore, only proposed now to take the usual winding-up order, and appoint the gentlemen named liquidators of the Company.

Mr. BENTLEY, who appeared for the Company, did not raise any objection to the course suggested.

Order granted accordingly.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

MEETING OF VESTRY DELEGATES.

The Adjourned Meeting of the Delegates from the Vestries and District Boards of the Metropolis, convened to consider the London Water Question, was held last Wednesday, in the St. Martin's Vestry Hall—Mr. E. J. WATKINSON again presiding.

After some introductory remarks by the CHAIRMAN,

Mr. J. BEAL said he transmitted to the Home Secretary the resolution passed at the last meeting (see ante, p. 651), recommending that the Government should introduce a Bill constituting a Water Authority of a representative character; and had also addressed a communication to the Home Secretary asking whether parliamentary notices of such a Bill would be given by him, limited to such an object. To this the following reply had been received:—

Sir,—I am directed by the Secretary of State to acknowledge the receipt of your letter of the 20th inst., containing a copy of a resolution passed at a meeting of the Metropolitan Delegates on London Water Supply, inquiring whether Government intend to introduce a Bill, and to inform you, in reply, that Secretary Sir William Harcourt will be glad to receive from the Delegates any representation on the subject, and will be glad to give any such representation his careful attention; but, in accordance with well-established practice, he must decline to answer questions as to the intended legislation of next session. (Signed) GODFREY LUSHINGTON.

To this, as there was no time to lose, the following letter had been sent on behalf of the conference, to Sir W. Harcourt:—

Sir,—I am in receipt of your communication of the 23rd of October inst., being your reply to a resolution of Delegates on the Metropolitan Water Supply, "inquiring whether Government intend to introduce a Bill as recommended by the Committee of Session 2, 1880."

In reference to the latter paragraph of your letter, in which you state that "in accordance with well-established practice, he (you) must decline to answer questions as to the intended legislation of next session," I desire to state that this is perfectly correct as to public Bills not requiring statutory notice. I acted as Honorary Secretary to Delegates of Vestries on Metropolitan Gas in 1857, 1858, 1859, and 1860, and again in 1867 and 1868, and on Water in 1870. Upon each of these occasions it was recognized that any scheme must give the notices required by the Standing Orders of Parliament, we should be informed of such notices, and the Delegates would be given notice in order that if the Government failed us we could take our own course as to advertising the notices.

As these notices must be inserted in the *Gazette* on or before the 15th of November, and in the event of the Government declining to do so, must be inserted in the interest of the ratepayers, either by Vestries or the Metropolitan Board, or the City Corporation, I have to ask you, in the words of the words of the Standing Orders, "in the parliamentary practice to which I have referred, and the precedents which I have quoted, and again referring to the resolution of the Delegates, whether notices will be given by the

Government, or whether you leave the Delegates or the Local Authorities of London to take their own course.

The only representation we desire to make at present is that, in view of legislation in the coming session, the Government will at the earliest moment inform us whether they will give the requisite parliamentary notices (without asking any expression of opinion as to the form they will assume in the Bill proposed), so that we should be enabled to give any such steps to secure legislation on this great question as we may be advised.

The Delegates will meet on Nov. 3 to consider your further reply, and no doubt will appreciate if you desire it, a deputation to wait upon you if that is the best mode of learning your decision.

You will note that, by the results arrived at at their last meeting, they simply ask whether you will be the notice for a Bill to establish a Water Trust, the inference being that they will be content to leave that to body, when created, the dealing with, and settlement of all interests involved, and the future water supply of the Metropolis.

I shall esteem your early reply a favour.

(Signed) JAMES BEAL.

He added that no reply had been received to this last communication.

Mr. BEERY then moved, and Mr. HAYES seconded—"That having received the reply of the Home Secretary, the delegates address themselves to the question of the proposed Water Trust.

Mr. MORR moved as an amendment—"That a memorial be presented to the Home Secretary, embodying suggestions as to the proper course to be adopted with the view of an Act being passed for the acquisition of the undertakings of the various Water Companies; to provide for an efficient and economical supply of water to the Metropolis, for the creation of a Water Authority, and to carry out the work; and that a Sub-Committee be appointed to prepare such a memorial and bring up a draft for consideration."

Mr. PRATT seconded this amendment.

A long discussion then ensued; but ultimately the motion as proposed by Mr. MORR with a small portion of the amendment as a rider to it—"That a Sub-Committee be appointed to prepare suggestions in reply to the Home Secretary's request, and to bring up a report for consideration."

A Committee of seven was appointed, and the meeting adjourned till tomorrow, the intention being to offer the suggestions to the Government before the expiration of the time for parliamentary notices to be given.

[Since the meeting the following reply to his letter, published above, has been received by Mr. Beal:—"Whitehall, Nov. 8, 1880.—Sir, I am directed by the Secretary of State to acknowledge the receipt of your letter of the 28th ult., again pressing for information as to the intentions of Her Majesty's Government with regard to legislation in the next session of Parliament on the subject of the Metropolitan Water Supply; and I am to refer you to the answer given by the Earl of Fife, on the part of the Government, in the House of Lords on the 16th of August last, in reply to a question on the same subject. (Signed) Godfrey Lushington."]

COURT OF COMMON COUNCIL.—At last Thursday's meeting of the Court, Mr. P. Morrison's motion—"That it be referred to the Gas and Water Committee to consider the advisability of offering a substantial premium or premiums to engineers and others for the best plan or mode of supplying the City or the Metropolis with water, having especial regard to efficiency, quality, and economy, and to report thereon fully to this Court," with which reference has already been made in the JOURNAL, was agreed to.

The following are the returns made by Dr. C. Meymott Tidy, on the Composition and Quality of the Metropolitan Waters in October, 1880:—

[The results are stated in grains per Imperial gallon of 70,000 grains.]

NAMES OF WATER COMPANIES.	Total Solid Matter.	Oxygen required by Organic Matter, Gr. &c.	Nitro- gen. As Ni- trate, &c.	Ammo- nia.	Hardness (Clark's)	
					Before Boiling.	After Boiling.
<i>Thames Water Companies.</i>						
Grand Junction	22.13	0.064	0.135	0.000	15.4	2.4
West Middlesex	21.57	0.060	0.135	0.002	15.4	2.4
St. James's and Vauxhall	21.63	0.084	0.146	0.000	14.3	2.4
Chelsea	21.63	0.084	0.146	0.000	14.3	2.4
Lambeth	21.85	0.088	0.104	0.000	15.4	2.8
<i>Other Companies.</i>						
Kent	33.61	0.000	0.427	0.000	22.4	5.1
New River	21.39	0.028	0.135	0.000	15.4	2.4
East London	22.64	0.064	0.146	0.000	15.5	2.4

Note.—The amount of oxygen required to oxidize the organic matter, nitrates, &c., is determined by a standard solution of permanganate of potash acting for three hours.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, the West Middlesex Water Company.

SALE OF SHARES IN THE NEW RIVER COMPANY.

A large number of stockbrokers and capitalists attended at the Auction Mart, Tokenhouse Yard, E.C., on Wednesday last, when Messrs. Edwin Fox and Bousfield offered for sale by auction some fractional portions of the entire stock of the New River Company, as well as a few new shares in this important water undertaking. The portions of the stock offered, submitted for sale consisted of the tenth of a share in the King's's Moieity, and the eighth of a share in the Adventurers Moieity, these being, as is now generally known, the two classes into which the 72 original shares in the Company are divided. An option on an original share is real estate, and confers upon its possessor a parliamentary right for, under the provisions of Hertford and Middlesex. The new shares are of recent creation, and are of the nominal value of £100. They rank *pari passu* with the original shares, but do not confer any voting powers.

The portion of the Adventurers Share was the first put up. It was divided into 15 lots, each representing the 120th part of the entire share, and the proportion of dividend payable at Midsummer last in respect of each lot was £19 18s. The first lot was sold for £790, being at the rate of £49,800 for the complete share, and the same price was realized for lots 12 to 15; five of the other lots were knocked down at £785 each, and the other five at £790 each. The tenth part of a King's's share was then offered,

in 10 lots, six of which were sold for £910 each, two for £900 each, and two for £895 each. The new shares came next, and of these there were 30. The three shares of Midsummer last were sold at the rate of £11 1s. 6d. per annum. Six of the shares fetched £430 each; sixteen, £435 each; and eight, £430 each. The fractional portion of the Adventurers share submitted for sale realized £11,775; the portion of the King's's share, £9000; the 30 new shares, £11,240; making a total of £32,065 as the proceeds of the sale.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Ordinary Half-Yearly Meeting of this Association was held at the City Terminus Hotel, Cannon Street, E.C., on Tuesday, the 2nd inst.—Sir JULIAN GOLDSMID, Bart., in the chair.

THE SECRETARY (Mr. R. S. Gardiner) read the notice convening the meeting, and the following report:—

The present half-yearly ordinary meeting of the Proprietors has been convened, in conformity with the Company's Act of Parliament, for the purpose of receiving a report from the President and Directors upon the affairs of the Association, and for declaring a dividend for the half year ended June 30, 1880.

The following figures show the result of the workings at all the stations, including all those in France:—

Gas Made.—The quantity of gas made in the half year ended the 30th of June last was 2,000 million cubic feet; the quantity made in the corresponding half year of 1879 was 2701 million cubic feet; showing an increase of 106 million cubic feet, or at the rate of 3.92 per cent.

Lights.—The total number of lights on the 30th of June last was 1,282,284; the number on June 30, 1879, was 1,249,177. These figures give an increase of 33,607 lights, or at the rate of 2.7 per cent.

Leads.—The length of mains laid on the 30th of June last was 1273 miles; the length of mains laid on the corresponding half year of 1879 was 1256 miles; being an increase of 17 miles.

Rental and Profit.—The rental for the half year now under review exceeded that of the corresponding half year of 1879, and there was also a slight increase in the profit.

Coal.—A comparison of the cost of the coal employed during the half year, with that of the coal used in the corresponding half year of 1879, shows a reduction of not quite 2 per cent.

Secondary Products.—The values of the coke, tar, and ammoniacal products have advanced during the period under review. Every attention has been paid to the improvement of residuals, and a tar distillery is in course of erection on the works at Forest, Brussels.

General.—The plant at all the stations was maintained in a proper state of efficiency at a reasonable cost. The expenditure on the usual extension and enlargement of mains was moderate.

At Vienna two scrubbers were erected on the Währing works, and the works at Tabor received a new condenser. A gasholder-tank and house for the gasholder were built on the Fiedberg works. The Baumgarten works were put in a new and improved state.

Progress was made with the improvements and improvements which are requisite at the new French stations. Land for the enlargement of the works was purchased at Arras and Valenciennes. Evenings' gas was sold at Estaires.

The President and Directors have to announce the purchase on the 29th of June last of the gas-works at Flushing, from the Municipality of that town, with whom a contract has been concluded for the period of 30 years.

The Proprietors are aware of all the events which led to the contract for the public lighting at Ghent being given to the Société Financière. Last April the Municipality of Ghent, by a special notice, informed the Proprietors of the Association of the expiration of their contract on the 1st of July, 1881, and to remove their mains. The Association replied to this notice by again asserting their right to continue to supply gas to private consumers, and to the Association, and to the original owners, and their intention, of course, to exercise that right. A suit has in consequence been commenced by the Municipality and the Association, and the preliminary pleadings have been delivered.

It is now the duty of the President and Directors to record the lamented death of Mr. Arthur Lucien, who died on the 29th of June last, at the age of 23 years, and constantly took an active part in all that concerned its welfare. The vacancy thus created on the Board has been filled by the election of Mr. Arthur Lucien.

It is also with much regret that the President and Directors report the death of Mr. Kenelm Digby Wingfield, who, during his brief connection with the Association, fulfilled the duties of a Director for the period of 18 months, and last and ability. Mr. Herbert Valentine Lindon has been appointed as his successor.

The President and Directors desire, in conclusion, to draw the attention of the Proprietors to the fact that the accounts for the half year ended June 30, 1880, have been duly audited, and from them the Directors have, in accordance with the provisions of the Companies Clauses Consolidation Act, prepared a schedule showing the profit of the Association for the year, and the amount of the dividend payable to the Proprietors, and the dividend which the President and Directors recommend now to be declared—namely, a dividend of 5 per cent. for the half year ended the 30th of June last, and a bonus of 1 per cent., payable free of income-tax on and after the 1st day of December next.

THE PRESIDENT: The report which you have heard speaks for itself.

The difficulties of the Association are, as you know, on a principle which has been approved by the Proprietors for many years past, we have endeavoured, as far as possible, to maintain the value of our works, and at the same time to treat fairly our consumers in all parts of the Continent. I told the Proprietors at our last meeting that the Board of Directors, as directed, as opportunity arose, to add to the field of their operations by purchasing other gas-works, and that we had then negotiations going on regarding such a purchase. I could not, however, give further particulars then, because it might have interfered with the bringing of those negotiations to a satisfactory conclusion; but we are now able to announce that we have purchased the gas-works of the rising town of Flushing. We have made a very good contract with the Municipality and the Municipality of Flushing. The statement in the report with regard to Ghent does not require any addition from me. I told you last time that the Directors were making some provision in case the lawsuit then pending should turn out wholly or partially unsuccessful, though we have no doubt that it will be successful. I believe that in the course of the year we have also set aside a moderate amount for the purpose. The new French stations are improving, as you have learnt from the report, and we hope in time they will be put in proper order, as well as the Flushing works, which at present require a considerable amount of attention. One of the French stations—Paris—has been the only one in the world where the contract was about to expire; but I am happy to say that we have recently, since the date of the report—we always like to tell the Proprietors anything occurring in the interval between the date of the report and the meeting—been able to make a satisfactory contract with the town for 30 years. There is a very small station, which probably none of you have ever heard of, which was included in the purchase we made of the Gantier works; and as we had an offer for it we have sold it. This has also occurred since the date of the report. Then there is one matter that concerns us, which I think is very satisfactory. We have, under our Act of Parliament, a right to hold our meetings in the month of May and November, and the Act does not specify the exact date; and we found we could close our accounts rather earlier, owing to the better communication we now have with all parts of the Continent and recent arrangements in our financial department. We therefore, for the first time, hold the meeting earlier, and propose to pay the dividend on the 1st of May, as before, and we hope to continue to do this each half year in future. The only other matter I wish to refer to is a subject I mentioned at our last meeting—the death of Mr. Twells. The Directors were all very sorry to lose his active concurrence and exertions in the management of

the affairs of the Association; but we have endeavoured to supply his place in a suitable manner. As at a Board like ours, where a large number of technical details have constantly to be considered, it is of great advantage to have civil engineering talent, we have elected as our Directors Messrs. Arthur and B. C. Brown, who are capable of doing very valuable work for the Association. As I stated at our last half-yearly meeting, we have filled Mr. Wingfield's place by the selection of Mr. Lindon, who is a very capable and energetic man, and who has been elected by Mr. Lindon. Mr. Lindon has shown the greatest capacity for the work he has had to undertake. There is very little difference in the profit made between this and last half year, and the Directors propose to declare the same dividend as last year. As the Association has been very successful, we see rapid fluctuations. If we take a step in advance, which we are always glad to do, we like to maintain it, and I think you will agree that this has always been done. A new member has been elected to the Association, and the new member has entered on the report upon the affairs of the Association.

The DEPUTY-CHAIRMAN (Mr. H. Wood) seconded the motion, and it was carried unanimously.

On the motion of the DEPUTY-CHAIRMAN, seconded by Mr. F. BASSÉTT, the dividends recommended in the report were unanimously declared. Mr. A. J. DUFF FILER moved a vote of thanks to the Directors for the manner in which they had conducted the affairs of the Association. The motion was seconded, and unanimously agreed to.

THE DEPUTY-CHAIRMAN : At the Chairman's request I beg to acknowledge, on his part and the part of my colleagues and myself, your kindness in continuing to us your confidence. I can only say that no exertion shall be wanting on our part to carry on the business of this great corporation in the efficient way we have hitherto been allowed to do. I have now to propose that our thanks be given to Mr. L. G. Drury and to the Agents, who have so ably assisted us in the discharge of the duties of the Committee and fulfilled of the duties entrusted to them. We can speak most highly of them all, and I have very great pleasure in proposing this vote.

Colonel WILKINSON seconded the motion, which was carried unanimously. The proceedings then terminated.

BAHIA GAS COMPANY, LIMITED.

The Ordinary Half-Yearly General Meeting of this Company was held at the London Offices, Idol Lane, E.C., on Thursday, the 4th inst.—

The SECRETARY (Mr. Alfred J. Head) read the notice convening the meeting, and the following report was taken as read:—

The Directors herewith present the statement of accounts for the half year ending June 30, 1880.

The half year's working has resulted in a profit of £6814 16s. 5d., making with the balance brought forward from the last account £7222 13s. 8d. There has been written off from preliminary expenses, £1614 17s. 3d. The Directors recommend the usual dividend on the preference capital, and a dividend at the rate of 6 per cent. per annum (free of income-tax) on the ordinary shares, which will absorb £5200; leaving to carry forward, £407 16s. 3d.

The Directors retiring by rotation are Mr. Joseph Quick and Mr. Horatio Brothers and the Auditor retiring is Mr. Magnus Ohren, who, being eligible, offer themselves for re-election.

Dr.		Balance-Sheet, June 30, 1880.		Cr.	
Capital—					
5000 ordinary shares . . .	\$100,000 0 0	Investment to Dec 31, 1879 .	\$110,076 4	9	
1000 10 per cent. preference shares . . .	20,000 0 0	Less depreciation of lamp services . . .	120 0 0		
1000 7 1/2 do. do.	30,000 0 0				
Debitures	2,650 0 0				
Creditors					
On open accounts . . .	624 10 8	Concession	\$10,456 4	9	
On acceptances	11 9 0	Meters fixed	7,600 0 0		
Dividends unpaid . . .	32 13 1	Office furniture and fixtures . . .	286 6 6		
Debiture interest . . .	77 16 10	Preliminary expenses	15,300 0 0		
Insurance	47 10 4	Amount due for gas, fittings, &c. .			
Interest paid	2,540 0 0	Stock of coals, &c., &c.	9,555 9 8		
Profit and loss	\$5,607 15 6	Goods in transit	11,587 18 8		
		Bills receivable	148 12 0		
		Cash at Bankers	3,900 0 0		
		General account	204 2 3		
		Dividend account	110 10 1		
		London office	10 0 2		
		London and Brazilian Bank . . .	196 3 0		
		Bahia office	280 3 1		
	\$161,656 1 10		\$181,656 1 10		

Revenue Account, for the Half Year ending June 30, 1880.

Cells carbonized	\$2,465 16 6	Gas supplied to	
Purifying materials and wages	200 3 1	Public lamps	\$2,914 3 2
Carbonizing wages	1,098 5 1	Less fines	202 13 8
Oil, gas, yardmen, &c.	241 14 6		
Repairing &c., mains and set- tles	585 18 10	Private consumers	\$2,911 9 6
Lighting and repairing public lamps	1,104 4 8	Public establishments	971 15 11
Salaries	1,842 9 7	Motor-transport	563 8 3
Directors fees	400 0 0	Products	\$2,869 13 11
Auditors fees	21 0 0	Less labour	80 16 10
Rent and taxes	921 0 0	Transfer fees	2,388 6 1
Interest and discount	413 0 0	Profit on fittings	249 2 6
Stationery	52 30 10	Bad debts recovered	10 18 7
Office expenses	17 5 5		
Trade charges	186 10 0		
Travelling expenses	33 15 0		
Wear and tear	1,048 17 7		
Bad debts and allowance	335 15 4		
Exchange	937 6 4		
Law charges	18 17 4		
Preliminary expenses— amount written off	1,614 17 3		
Balance, being net profit for the half year	5,199 19 2		
	\$20,614 8 0		\$20,614 8 0

Profit and Loss Account

Dividends declared May 20, 1890	\$4,625 0 0	Balance, Dec. 31, 1879.	£5,164 8 11
Income-tax upon ordinary shares	52 1 8	Revenue account, profit for the half year	5,199 19 2
Debt interest to the 30th of June.	79 10 0		
Balance	5,007 16 8		
	£10,365 8 1		£10,364 8 11

The CHAIRMAN, in moving the adoption of the report and accounts, said that the features of the Company were in many respects not dissimilar to those of the other companies from which they were at the last meeting, excepting so far as he thought they might be considered favourable. Turning to the balance-sheet, the Shareholders would see that the item of acceptances stood at only £110,000 in June, 1879, the amount was £3800, and in the last account it stood at £2000. He thought that it was a very good result, and was showing that the Company were able to pay their way without resorting to other modes of raising money. On the other side of the account the

Shareholders would see that the Directors had dealt with the preliminary expenses. He mentioned on a former occasion that there were certain items in the accounts which appeared as assets, and which had, of course, been paid, but which really represented nothing at all; and he then stated that the Company had been very careful to carry forward and to present accounts it would accordingly be seen that £1614 had been written off preliminary expenses. With regard to the Company's trading, the amount remained singularly similar to what it had been for a long time. He thought that the only thing to be somewhat worried about was the consumption of gas on a large scale. In such a sensitive city as Bahia, he thought the private consumption ought not to stand still, as it had done for some time. He considered this was one of the worst features of the Company's business—that the consumption did not increase anything like the increase in the population. He thought that the Company ought to be charged for gas, and the competition of petroleum proved the gas consumption from being so large as it otherwise might be; but for his own part he would rather make some little sacrifice in order to get the gas consumption down to a reasonable figure. He thought that the Shareholders might be quite sure engaged the attention of the Directors very much. It was a difficult problem, but now that the Company was in a fairly good position, he thought they must look to the future. He thought that the Company had been very successful. The accounts showed a difference of but a few tons as compared with December last, and was only about 50 or 60 tons more than in the previous June; but the receipts per ton of coal for the half year ending this June were about 36 more than in December, being 118s. 6d. against 115s. 6d. and 112s. 9d. in the previous half year. He thought that was a very satisfactory. The coals had cost a little extra, but he believed that freights had been rather more, and he was afraid that freight all over the world was more likely to increase than diminish. If trade really continued to expand, he thought that the Company would have a very good margin on the Company's accounts, but as they had a tolerably good margin for this, he did not think they would receive much injury. The worst feature in the accounts was the matter of exchange. The Company were still suffering from the depreciation of the dollar, but he thought that the loss of exchange was only £31d., instead of 57d., which was a very serious thing. They, however, had no control over this matter, but he hoped things would eventually right themselves, and in this case the Company would receive a considerable benefit. The loss on exchange could be very easily 1 per cent in the year, and he thought that the loss on the year 1901 on the other side of the account the items were all very similar—there was a slight reduction in the private consumption and public lamps, but the amount altogether was only £30s. The profit on fittings was also less. He thought that the Company had been very successful in the year 1901. He thought the Company had made they had in hand. This showed that if the dividend had not very much increased, the Company were in a sound position. They had been able to increase it by 1 per cent, to write off the sum mentioned from the preliminary expenses, and to carry forward an amount in balance.

The DEPUTY-CHAIRMAN (Mr. H. Brothers) seconded the motion, and it was carried unanimously.

The CHAIRMAN then moved that the maximum dividends on the 10 and 7½ per cent. preference shares, less income-tax, and a dividend at the rate of 6 per cent. per annum, free of income-tax, on the ordinary capital of the Company be declared.

Mr. MAGNUS OHREN seconded the motion, which was carried. The retiring Directors and Auditor were then severally re-elected.

Mr. LINGING referred to the balance-sheet as an evidence of the prosperous

position to which the Company had been brought, and said he did not mind saying that the Chairman had done justice to himself and the Directors in their remarks of the 4th inst. The present condition of the Company must nevertheless entail a large amount of labour, and he thought the Shareholders were entitled to much more than the £100,000 which had been voted for the year. The Company passed through nothing but evil times, and when they joined together they found it in a slough of despond. He considered under the circumstances instances that there was something more due to the Directors besides the customary vote of thanks. He therefore moved that the remuneration of the Directors be raised from the last of July to £1200 a year. It was also moved and agreed that the Directors should be paid for the first half of the year. It was also moved and agreed that the Directors should be paid for the first half of the year.

Mr. ANDREWS, in seconding the motion, fully endorsed the remarks of Mr. Lingard.

The motion was carried unanimously.

THE CHAIRMAN, in replying, expressed the thanks of his colleagues and himself. Reference had been made to his modest statement with regard to the Company's affairs, but as long as he had been chairman of a company he had been bound to do his best, and he was sure that he would hold out expectations that might possibly not be realized. He thought too much credit had been given to the Board for what they had done, for he believed that the nature of circumstances had greatly brought about what had happened. No doubt the Directors had been very level-headed, and he was glad to assure the Directors great anxiety, but they had succeeded in reducing it, and to this fact was, in great measure, attributable the Company's present improved position. The Secretaries had received a letter from the Engineer (Mr. Muriel), who stated that he was going to visit the works of the Company, and he was sure that the factory as they were at present, and he also talked about there being more dividend. However, the accounts spoke for themselves, and he only hoped the Company might be able to pay an increased dividend. The Chairman then asked the Secretary to conduct the Company's affairs and dealing with the fund, at their disposal.

The DEPUTY-CHAIRMAN said the Board were highly pleased with the way in which Mr. Muriel conducted the Company's business, and the excellent carbonizing returns he now made. He (the Deputy-Chairman) said nothing to prevent the Shareholders receiving a higher dividend, and he should say that the limit ought not to be less than 10 per cent. He moved that the best thanks of the meeting be given to Mr. Muriel.

Mr. FINLAY seconded the motion, and it was carried unanimously.
Mr. ANDREWS next moved, and Mr. KENT seconded, a vote of thanks to the Chairman and Directors, and the resolution was carried unanimously.

The CHAIRMAN briefly acknowledged the compliment.

A vote of thanks was then passed to the Secretary, and the proceedings terminated.

THE WATER SUPPLY AND SEWERAGE OF WHITCHURCH.—At a meeting

the Whitchurch Local Board, on the 3rd inst., it was unanimously decided

to at once proceed with a water-works and sewerage scheme, and to make application to the Local Government Board for their sanction to borrow

application to the Local Government Board for their sanction to borrow for the purpose a sum not exceeding £10,000.

SALE OF GAS SHARES AT HULL.—At a recent sale of gas shares at Hull

the following prices were realized:—For 40 "A," 20 "B," and 20 "C"

shares in the Sutton, Southcoates, and Drypool Gaslight Company, £

paid up on each, £18 per share; for 40 "D" shares in the same Company £4 paid up, £5 6s. per share; for 2 shares (£25) in the Kingston-upon-Hull

£4 paid up, £6 s. per share; for 2 shares (£25) in the Kingston-upon-Hull Gaslight Company, Limited, £22 10s. paid up, £54 each.

Gaslight Company, Limited, *etc.* 100. Paid up) 1000 shares.

MIDLAND ASSOCIATION OF GAS MANAGERS.

At the close of the conversation which followed Mr. Hunt's remarks on the subject of the comparative diffusive power of square and circular lanterns, as reported in last week's JOURNAL, the reading and discussion of papers was proceeded with.

Mr. G. E. STEVENSON (Peterborough) read the first paper, as follows:—

THE MANUFACTURE OF SULPHATE OF AMMONIA.

The residual products resulting from the manufacture of coal gas have during the last ten years received a much greater share of attention on the part of gas companies and of corporations having the gas supply in their hands than was formerly the case. One of the reasons for this is the increased value of the tar and the ammoniacal liquor—the tar on account of the development of the demand for tar products consequent on the discovery of the aniline dyes, and the liquor for the salts of ammonia into which it is now universally manufactured. At first those companies who had made long contracts for the sale of these residuals were well content to find on the expiration of the contracts, that the value of the tar and of the liquor had increased enormously, tending being in some cases made at a price more than double that of the former contract. In regard to tar, there are at present few gas makers who care to take upon themselves the risks and responsibilities attendant upon the distillation and the preparation of benzol and anthracene, while the further manipulation of these substances into the dyes of commerce is, I believe, in the hands of a comparatively small number of manufacturing chemists, who keep the practical part of the process as much as possible a secret from the world at large.

As the rapid advance has during the past two or three years been a diminution in the value of tar products, the supply appearing to have somewhat exceeded the demand, and the manufacture of these products has not of late yielded much profit. I am not aware that any gas company, with the exception of The Gaslight and Coke Company, has been well satisfied with the return derived from the sale of the tar and the working up of their tar themselves, the general impression being that an equally good profit may be made by the sale of the raw tar as by attempting to distil it on a small scale. The case is different in regard to the ammoniacal liquor. The working up of the liquor *in situ*, instead of selling it to private contractors, appears to be the way to go, with improvements in scrubbing appliances, both springing from the desire to realize the utmost value from the source of profit which the ammonia existing in coal gas presents.

Whether the demand for ammoniacal salts will continue firm, in the face of the great increase in the demand, is a question which cannot easily be decided. Although the price of sulphate of ammonia is partly regulated by that of nitrate of soda, the former appears to be gaining in favour as possessing its nitrogen in a better form for the treatment of the soil, and it seems probable that for this reason, and also because of the more extended use of artificial manures of this kind, we shall not for many years see the production exceed the requirements of the agricultural world to this article of commerce. However this may be, at the present time the ammoniacal liquor is a valuable residual of gas manufacture, and it has become a matter of considerable importance that its full value should be realized by the undertakings themselves, and that the profit derivable from it should be allowed to pass into the hands of the intermediate class of manufacturers, especially as the production of sulphate of ammonia is no complicated process requiring special scientific knowledge or skill on the part of the manufacturer, nor necessarily attended by any risk or danger.

Although a price can sometimes be obtained for the liquor which will realize as much profit as if the liquor were worked up into salt, in most cases this is not so. The ammoniacal liquor, being bulky, its carriage is costly, whereas the manufactured salt, bearing a high value in comparison with its weight, can be delivered within any reasonable distance at a moderate expense. The position, therefore, is again to be decided in favour of the acid required in the manufacture is a matter of importance, as this chiefly decides the question whether the manufacture of sulphate of ammonia may be profitably carried on or not. The apparatus to be used is a point worth careful study, and it is this that I desire chiefly to consider in my paper.

It seems to have been at one time a prevailing opinion that any rough-and-ready method of procedure would do for this department of manufacturing chemistry. The great desideratum, it was supposed, was to have an apparatus as simple and as cheap as possible. Being a bye-product in a gas-works, upon which the gas-works are dependent for their existence, and so long as the liquor was somehow or other worked up with the salt got rid of. An old boiler was purchased and fixed along with a saturator of the roughest description. The liquor was put into the boiler, a certain quantity of lime added, and the whole boiled up till the ammonia had distilled over, when the fire was drawn, the boiler emptied, and the process commenced afresh. The saturator was a box with a moveable lid, and after the acid had been put in, the lid was adjusted, the fume-pipe connected to some chimney flue, and when the charge was neutralized the lid was removed and the salt got out. Fresh acid was from time to time added, and the process repeated, and it would often happen that the charge was saturated before the ammonia was worked off, in which case it was necessary to remove the lid, and introduce an additional supply of acid while the brevings was proceeding, at the imminent danger of suffocation from the ammonia and other vapours from the still saturated, and the same danger attended the removal of the acid, of course, only to be tolerated when the manufacture was a very small way indeed. Various improvements were introduced, modifying these defects. A diaphragm was introduced into the saturator, cutting off that portion of it receiving the ammonia, and what is called the pocket saturator was from time to time resorted to, and the pocket was closed by a sliding shutter in the top or side to insert the acid and withdraw the salt. A second boiler has been in some cases introduced, and the liquor distilled by means of a perforated steam-pipe instead of by direct firing. In this form numerous appliances are existent at the present time, doing efficient work.

This system of manufacture, however, entails two evils which cannot be got rid of, except by an entire change of procedure. Firstly, the process is intermittent. The charge of liquor in the boiler must be worked off, run out, and a fresh supply put in before the distillation can be continued. Even if the boiler were fed with a constant supply of liquor, the stream of ammoniacal gas must be stopped while the boiler is emptied and charged afresh. All this implies loss of time, and the consequence is the apparatus must be designed of larger capacity for a given production of salt than would be necessary if the process were continuous.

Secondly, the process is dangerous. The consequence of the ammonia salt being deposited in the saturator, the latter must of necessity be opened for the purpose of getting out the salt. In this lies a source of danger which has produced in gas-works alone, during the past two years, two disasters fatal to the lives of workmen employed. The danger arising from the possibility of opening the saturator during the distillation may be reduced to a minimum in the case of extensive plants, where constant supervision is exercised. At Beckton, for instance, where the saturators

are placed under a large shed open at both ends and well ventilated, the pocket saturators there used may perhaps blow with impunity, but in small works, where the shed is not so large, and the atmosphere of the space is confined, such an arrangement is often a fruitful cause of accident.

In order to obviate the necessity of interrupting the production of ammonia from the gas liquor, the method has been resorted to of passing the ammoniacal liquor through a column filled with coke, or other material calculated to divide up the liquor into fine streams, and subjecting it to the influence of steam introduced at the bottom of the column, by which means the ammonia is distilled out of the liquor as it passes through the column. The Coffey still also presents a ready and suitable contrivance for this purpose; the liquor flows backwards and forwards over a series of trays from the top to the bottom, and the steam, which rises up over the surface of the liquor. I am unable to state when either of these appliances was first made use of for distilling ammonia. The coke column is, I believe, favoured by many private manufacturers. It occupies a considerable space, and cannot, on account of its height, be conveniently placed under cover, otherwise it gives, I believe, satisfactory results.

The Coffey still is used of various forms and dimensions, and there appears to be a considerable difference in its efficiency according to the design. Some stills never take out all the ammonia from the liquor, and are consequently to be classed as defective examples of this appliance. The liquid must traverse a sufficient length of tray, and must flow over the trays in a sufficiently thin stream, and must occupy a certain length of time in travelling from the top to the bottom of the still, otherwise the distillation will be imperfectly performed. If these considerations be fulfilled, I know of no better system of distilling ammoniacal liquor, and, as far as the possibility of a better system is concerned, the saturator, it is only necessary to have recourse to the evaporative process. If the acid be used in a concentrated condition, the salt will be deposited in the saturator, and must be removed in a solid form; but if the acid be diluted, the salt will remain in solution after the charge is neutralized, and the liquid must be evaporated to a consistency to cause the salt to crystallize. If this plan be adopted, the saturator may be altogether closed, the acid being run in by a syphon-pipe from a tank, and the neutralized charge run off by an outlet-pipe at the bottom. When steps were taken three years ago to erect a sulphate of ammonia factory at the Gaslight and Coke Works, at Beckton, the first consideration was presenting the maximum of safety and certainty in working, and as my experience of the working of the apparatus has been eminently satisfactory, I have thought that a description of it might be not without interest to some members of this Association.

The engraving (fig. 1) represents a part of the building and the apparatus in use at Beckton. The factory proper is 20 feet square and 20 feet high to the springing of the rafters. The roof is constructed with a central square ventilator having louvres on all four sides. This and openings in the walls above head afford ample ventilation, which is further secured by air gratings over the windows. Arrangements for the storage of the building also comprise a chemical laboratory conveniently situated for experiments connected with sulphate manufacture. The liquor is pumped from the tanks in the yard, by a Tangey's "Special" steam-pump, into a wrought-iron tank fixed on brackets against the wall of the building, at a sufficient height to admit of running the liquor into the side up the vertical steam pipe represented in section in fig. 3 annexed. It is rectangular in form, and measures 4 ft. 6 in. by 3 ft., by 9 ft. long, and is constructed of 3-inch cast-iron plates firmly bolted together with 3-inch bolts. The trays are made of wrought iron, No. 12 B. W. G. in thickness, and they are turned up at the edges 3-inch. They are supported by wood packing between the plates of the side of the still. The spaces between the trays are only 3 inches in depth—much less than is usual in the Coffey still, and herein lies greatly the secret of successful working. If the spaces were greater the steam would pass away without coming into intimate contact with the liquid, and the height of still will not compensate for this, because the steam would lose its pressure in occupying the enlarged spaces, and the rush will be wanting which attacks and agitates the surface of the liquor. Although the still is only 9 feet high, the length of tray surface over which the liquor has to travel is 100 feet, and the liquor occupies ten minutes in passing from the top to the bottom of the still.

The steam enters at the bottom of the still, and along with the steam also the ammonia from the lime boiler, to which reference will be presently made. The ammonia and steam pass out by a 3-inch pipe from the top of the still to the saturators, of which there are two. These are rectangular boxes, upon which the trays are fixed, and the steam and ammonia saturators are bolted down by six long tie-bolts passing through wood cross-bars at top and bottom. They are lined with lead from 6 to 12 lbs. weight per square foot. The acid, diluted in the proportion of 2 parts of water to 1 part of acid, is supplied from a tank at a convenient level for gravitating into the saturators. The charge for one saturator consists of two carboys, or about 3 cwt. of acid. The neutralized charges are drawn off from the saturators into a settling-tank, and from thence, after the impurities have been allowed to settle, are run into the evaporating pan. This is a flat wood tank, 6 ft. by 7 ft. in area, lined with lead and containing a coil pipe (fig. 2) through which the steam and ammonia are passed. The coil is arranged round the sides of the pan, and the salt falls into a clear space in the centre. It is afterwards shovelled out on to an inclined draining-table, and when dried thrown through a trap-door in the wall into the adjoining store.

One of the principal nuisances from foul smells is an important thing when the works are situated in the neighbourhood of dwelling-houses, special means were taken to prevent the escape of any sulphurous fumes or ammoniacal vapour. The outlet-pipe conducting the waste gases from the saturators is carried round the building to a condenser situated outside, and any waste liquor which is washed down the waste liquor pipe, and the sulphuretted hydrogen is conveyed away by an underground pipe to the retort-house, where it is burnt in the main flue of the retort-settings, and passes out at the chimney as sulphurous acid.

It was found during the first year of working that the whole of the ammonia passing down the saturator and the steam and ammonia were not recovered in the condenser. To remedy this a catch-box was inserted in the fume-pipe. This small box, 2 ft. long by 1 ft. 3 in. wide, is filled with dilute sulphuric acid, and the pipe from the saturator dips into the acid, and is perforated in the same manner as the saturator inlet-pipe, so that the waste gases are washed down the waste liquor pipe, and are effectively prevented any ammonia from being lost. The box is emptied into the settler when acid is neutralized, and fresh acid introduced by a funnel at the top. In starting the apparatus, the still is first heated by passing steam through it, after which the charge is run into the saturator, and the steam and ammonia are passed down the waste liquor pipe. The bottom, and is run into a tank at the back of the factory. The steam and liquor supply must be regulated so as to get the maximum quantity of liquor without allowing any ammonia to escape at the bottom of the still.

When the apparatus was first designed, no provision was made for taking out the acid and the waste liquor from the saturator. During the past summer an arrangement was made for this purpose, as follows:—A plain cylindrical boiler was fixed at the back of the factory, and the waste

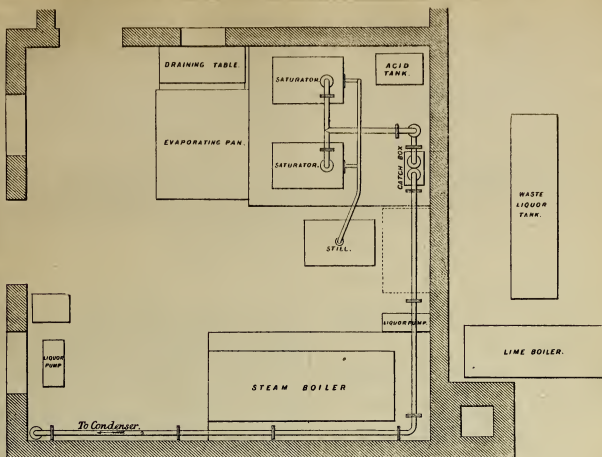


FIG. 1.—PLAN OF SULPHATE OF AMMONIA WORKS.

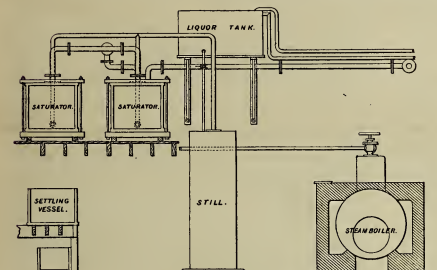


FIG. 2.—SECTION OF GENERAL PLANT.

liquor is pumped into it alternately with milk of lime. Instead of passing the steam from the steam-boiler direct into the still, as formerly, it is first sent through a coil in the lime boiler to agitate the liquor, and from thence passes into the still, carrying with it the ammonia driven off from the waste liquor. This arrangement works satisfactorily, except that traces of ammonia are washed back by the liquor descending through the still, which causes part of the work to be done over again. To obviate this, I intend to have the steam and ammonia from the lime boiler introduced higher up in the still, and use an accessory steam supply at the bottom of the still to liberate any remaining ammonia which may be washed down.

With regard to the productive capacity of the apparatus, it is found that with liquor of 9-ounce strength the apparatus can easily make 3 tons of salt per week. Only one man is employed, who receives occasional assistance from a labourer. Without working overtime, the man in charge can work off five carboys a day on an average, the liquor being delivered through the still at a rate of about 150 gallons per hour. A charge occupies four hours in working off, so that 2½ charges fall within one day's work. The evaporation of charges previously saturated goes on simultaneously with the distillation of the ammonia in the still. The factory is not worked at night, though this could, of course, be done if required. At present ten hours work per diem is more than sufficient for working up the whole of the liquor made, together with what can be purchased from small gas-works in the neighbourhood. After stopping work at the close of the day the boiler fire is banked up, and the steam-cock to the still left slightly open to keep the still warm. In the morning a very short time suffices to get up steam again and recommence work.

In concluding, I may express the hope that you will overlook the numerous defects in this paper. The subject is one upon which there is unusual difficulty in obtaining information as to what is done elsewhere, and I regret to say that, although I have asked for results from several gas-works, where apparatus differing from my own are in use, I have not been able to obtain anything which would justify me in drawing comparisons between the economical efficiency of the various descriptions of apparatus employed.

Discussion.

MR. MORLAND: What is the cost of the apparatus?

MR. STEVENSON said the whole expenditure on building and plant was about £1900; the building cost, he thought, rather more than half. If

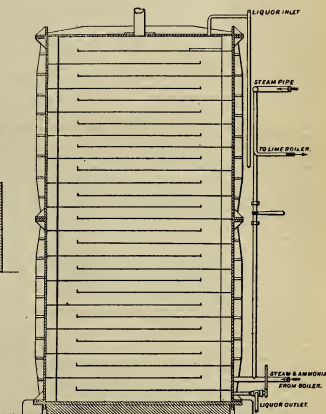


FIG. 3.—ENLARGED SECTION OF COFFEY STILL.

£4600 were put down for the plant, exclusive of the building, it would be sufficient.

MR. HUNT: I should like to know what becomes of the liquor after the ammonia is taken out of it.

MR. STEVENSON: It is allowed to go down the drains; but no nuisance arises.

MR. HUNT: What system of drainage is there at Peterborough?

MR. STEVENSON said new main drainage had just been completed, and there was a sewage farm. The liquor did not go into the main drainage. There was surface drainage, and the liquor went into that.

MR. NORTH: Into the river?

MR. STEVENSON: Yes.

MR. MORLAND: Have you ever ascertained what amount of fixed ammonia passes off with the liquor?

MR. STEVENSON said before they used the lime boiler there was fixed ammonia to the extent of 1½ oz. There was no free ammonia.

MR. HUNT: Is not the acid you use somewhat expensive—brimstone acid?

MR. STEVENSON: No; I do not find it expensive.

MR. WINSTANLEY: What is the strength of the liquor?

MR. STEVENSON: 9 oz., and the specific gravity of the acid is 1725; but I have not tested it when diluted.

MR. MORLAND said he had lately erected an apparatus on the tower principle for the manufacture of sulphate of ammonia. It had been worked

for some time, and they also treated it with lime, but the expense of the apparatus was not nearly so much as had been stated, perhaps not half, and he obtained very good results; in fact, he could, if they were working day and night, have two tons of sulphate made in 24 hours.

Mr. HUNT: What is your make compared with Mr. Stevenson's? How many tons of ammonia can you carbonize in the year?

Mr. MORLAND: About 11,000 tons in the year.
Mr. STEVENSON: I use about half that quantity.
Mr. MORLAND said he intended to fill the tower with round pebbles, but could not get them—they were scarce in Gloucester—so he put broken bricks.

He thought pebbles would have been much better.

Mr. HUNT: Do you use lime?
Mr. MORLAND: Yes.

Mr. HUNT: Do you lose any ammonia at the outlet—does any pass away with the liquor?

Mr. MORLAND: Very little. The gases from the lime vessel pass up into the tower; the steam is first introduced as it is here.

Mr. STEVENSON: At the bottom of the tower?

Mr. MORLAND: Yes. One of the difficulties I had was getting rid of the waste liquor, and I arranged to run it back into the retort-house, and use it on the hot coke.

Mr. STEVENSON: I found that plan caused a great nuisance one winter, when we were short of water for slaking the coke.

Mr. MORLAND: It would if you were in the immediate neighbourhood of houses.

Mr. HUNT: How about the coke?
Mr. MORLAND: There is a slight smell. We do not use the waste liquor pure upon it; we use some clean water.

Mr. HUNT: Do you use it all that way?

Mr. MORLAND: Yes.
Mr. STEVENSON: What do you find the cost of labour per ton of salt?

Mr. MORLAND: I should think 5s. or 6s. for labour in manufacture alone.

Mr. STEVENSON: Per ton of salt, not more?

Mr. MORLAND: I could not say precisely, because we have not been working long, and not continuously. Perhaps it would be more. I calculate we would make about £13 clear profit per ton. What return do you get per ton of coal?

Mr. STEVENSON: 24 lbs. to the ton.
Mr. MORLAND: I know that many years ago, at Cheltenham, it was 34 lbs. I believe Mr. Paterson is now getting 34 lbs.

The President: That depends on the coal used.

Mr. MORLAND: If all the ammonia is taken out of the gas, you can do nothing more.

Mr. DARWIN: We are selling our ammoniacal liquor at about 2s. 6d. per ton of coal.

Mr. MORLAND: What does the acid cost you?
Mr. STEVENSON: It costs 4s. 3d. without carriage. Carriage is 19s.

Mr. MORLAND: It might be worth while for Mr. Stevenson to know that it sells at £2 15s. at Leeds.

Mr. MORLAND: It is a question of carriage.
Mr. STEVENSON: I inquired at Sheffield, and found it would not suit; it was too weak.

Mr. MORLAND: The Sheffield Company buy from Leeds.

Mr. PRATT said he did not see there was all the danger about the old method which seemed to be imagined. Supposing a curtain was used, there need not be any escape of gas. In his case they never let it blow.

They keep a sufficient quantity of liquor in the vat itself, and it was perfectly safe. The charge could be drawn with safety to the workmen, and there were no offensive fumes. He thought there was no great objection to the ordinary saturators with curtains.

Mr. STEVENSON said he should like to know what was the fuel account in the process. He used about 5 cwt. of coke per day with the boiler; it was so small comparatively that they could not use breeze.

Mr. MORLAND: In my case the liquor is heated before it gets to the top of the tower. I pass the waste gases and steam through the heater.

Mr. HUNT: What price does it realize, after allowing for labour and wear and tear of coal, liquor, &c., which they used, and let loose all the ammonia?

Mr. STEVENSON: The gross profit last year was £627 10s.

The President: Divide that by the tons of coal. What was the quantity of coal?

Mr. STEVENSON: 5000 tons.

Mr. HUNT: What quantity of liquor per ton of coal do you get?
Mr. STEVENSON: It was 22 gallons; now it is much more with the new scrubber, and the strength is 8 to 9 oz.

Mr. MORLAND: The profit you made—2s. 6d. per ton—was prior to taking out the whole of the ammonia from the gas?

Mr. STEVENSON: No; at the present time. Prior to that, only a very small sum was realized for the liquor.

Mr. MORLAND said that at Leeds they obtained 3s. 2d. where they manufactured their sulphate; but supposing they sold the quantity of liquor produced at these works under the most favourable contract they had in connection with other works, they would receive even more per ton of liquor.

Mr. MORLAND: The quantity of liquor which they used let loose all the fixed ammonia. They did not realize this, but he was putting up a new apparatus, so looked to obtain 3s. 6d. per ton of coal, where they were having 3s. 2d. now.

Mr. HUNT: What quantity of liquor do you get per ton of coal?
Mr. MORLAND: 34 gallons of 11 lbs. strength.

Mr. STEVENSON: What coals do you chiefly use?

Mr. MORLAND: Anything that comes in cheapest.

Mr. HUNT: Is that the gross return from the sale of sulphate?
Mr. MORLAND: Yes.

Mr. COLLETT: Not the net gain you would have by making your own sulphate as compared with selling the liquor.

Mr. MORLAND: The 3s. 2d. we realize is not debited with anything in the way of interest on plant, but the plant altogether would be dearly bought at £300, so it would not amount to much.

Mr. STEVENSON: I have been told that about 4500 tons of coal were carbonized per year, they had an elementary apparatus which cost £130, and he found the profit in the year came to about £300; but he did not think they took out all the ammonia. He found he was able to outsell them beyond their own place with the salt; for he had sent salt beyond Boston at a better price than they could get.

Mr. MORLAND said he was putting up works for the manufacture of liquor resulting from, say, 40,000 tons of coal per annum. His estimate was that it was to cost £700, including the conversion of an old gasholder into a house.

Mr. HUNT: What is your experience in dealing with sulphuretted hydrogen and waste liquor?

Mr. MORLAND: We let the sulphuretted hydrogen go into the boiler furnace, and the waste liquor into the drains.

Mr. STEVENSON: I know a manufacturer who says labour costs him 30s. per ton of gas. Our expense is 11s. 6d. At the Crystal Palace District Gas-Works it costs about 22s. 6d. per ton for labour.

Mr. MORLAND: Is that labour in manufacture and packing?

Mr. STEVENSON: It includes in my case all the odds and ends.

Mr. MORLAND: Ours does not exceed 8s. per ton.

Mr. HUNT: That is a great difference.

Mr. NORTH said that so far as the Midland managers were concerned, he thought they had better sell their liquor. There was a certain amount of damage to the apparatus, and there was the labour and the capital to be employed, and he obtained better return by selling the liquor. In the half year ending the 30th of June, his liquor realized 3s. 618d. per ton of coal carbonized, and 407d. per 1000 cubic feet of gas made. The average strength was over 5½° Twaddell. He thought when such results could be obtained, it was better to sell the liquor.

Mr. MORLAND: It depends on the position of the works. In our case it costs 6s. per ton to bring liquor into the neighbourhood of Birmingham.

Mr. NORTH: I do not say it applies to Gloucester, but in this district it seems the better course.

Mr. LAYTON: I anticipate making 2s. per ton of coal carbonized.

Mr. REEVES: I think we shall get 2s. 6d., last year was 2s. 3½d. We were calculating the cost of an apparatus, but if we can get the advanced price Mr. North does, it seems better to sell the liquor.

Mr. NORTH: Mine is a price that has been in force for two years.

Mr. STEVENSON: If you can get such results, you will not find any gain by manufacturing sulphate. Formerly, when I sent the liquor away, we received £120 a year for it.

A MEMBER said he obtained 16s. 3d. per ton for liquor of 5° Twaddell.

Mr. NORTH: I get 18s. 9d.

The discussion then closed.

Mr. H. WOODALL (Leeds) read the following paper:—

METER-RENTS.

He said: In submitting for your consideration a few remarks on meter-rents, I think I am entering upon very familiar ground. There is much that is most plausible to be said on either side of the question, and I am far from believing that justice and expediency always incline to the same. I shall, however, deal with the case as it presents itself to me.

At the first blush it appears anomalous that a separate charge should be made for measuring a commodity which we have for sale, and that the cost of the measurement should bear no proportion to the quantity measured. In one case the cost to the purchaser does not exceed 0.1d., as against 10d. in another instance—a difference of 100 to 1. Anomalous, no doubt, and very unfortunate for all concerned, buyer and seller alike, that it is so. And it is to be the more deplored, seeing that he is commonly the man of small means who is in the most anxious position, and placed at a disadvantage by comparison with the large user. The hardship is aggravated where, in addition to meter-rents, a differing charge is made for gas. But the fact that the large purchaser universally reaps an advantage over the small one may at least be cited in extenuation of the ordinary practice of a gas company. Let us see if there be not justification also for its procedure.

Not to take a very extreme case for an example, I will suppose that a customer burns 5000 feet of gas per annum, and that the charge is 2s. per 1000 feet. The income in such a case amounts to 10s. a year. What are the costs of the Company attending this sale? First, we have the mains, which, taking blank spaces into account, will average not less than 7 yards to each customer; and will cost, with paving and reinstatement of road, 20s. A service-pipe will cost 7s. 6d., and meter connections 2s. 6d. Thus we have a capital expenditure, which may be directly incurred on account of the customer, and under consideration, of 38s. Interest and depreciation on this item, calculated at 10 per cent, will amount to 3s. per annum. Next we have to consider the item of leakage; which being probably greater upon small mains than upon large, and entirely independent of the quantity of gas passing along the pipe, may fairly be charged at the average rate of 1s. per annum, or 10 per cent on the capital cost. Loss by condensation in transit through the trunk mains. The average yearly loss per service-pipe is rarely less than 2500 feet. I shall therefore be within the mark if I assume the leakage on the main and service to be 3000 feet. The value of this in the gasholder I will take at 8d. per 1000 feet; so that leakage of 3000 feet will cost 24s. per annum. It will be well to be on the safe side, and the 5000 feet of gas consumed at the price in the holder—i.e., 8d. per 1000—and this gives 3s. 4d. After this comes the inspection of meters and collectors calls, together ten calls per annum. I will suppose that ten calls can be made per hour, and that the joint pay of collector and inspector amounts to 1s. per hour, which again is an understatement. Now, if we charge 1s. to each customer in incurred quarterly on account of his consumption. Book-keeping and postage will be worth 3d., and bad debts will average 1d.

Thus we have charges incurred by a company supplying 5000 feet of gas per annum—cash out of pocket—of 3s. A meter may cost 20s., and interest and depreciation on this item at 10 per cent. would be 2s., which added to the previous total would give 11s., and show an absolute loss of 1s.

I trust you have not failed to observe that in my anxiety not to overstate the case, I have omitted to charge anything (commonly averaging from 1s. to 2s. per 1000 feet) for interest on plant, maintenance of mains, other than that already included in the meter-rent, and the cost of management. On the other side, in giving the customer credit for a consumption of 5000 feet, I am treating the case in the same liberal spirit; for I find that at Leeds 10 per cent. of our customers pay us less than 10s. per annum.

Now, it is inevitable wherever the system of charging an uniform price is in vogue, and at Leeds no profit is sought to be realized, some portion of the custom must yield the exact cost, while other portions must result in profit and loss respectively. So that we must look to our largest and most lucrative customers to make good the losses incurred on account of the other section.

Is it rational or reasonable, under these circumstances, that any person should have it in his power to subject a company or corporation to an expenditure of capital on his behalf? Let him pay a meter-rent of 3s. per annum, and the loss of 1s. is converted into a gain of 2s.; and then, although he will still be indebted to other consumers, he may flatter himself that he is not a loser.

If a man burns but 1000 feet of gas in the year at a price of 2s., and pays 3s. for meter-rent, he is as badly off, no doubt, as if 5s. per 1000 feet were the price of gas and no meter-rent was charged. But I have shown what a tax upon others such a customer is where one price is charged throughout, and so far as he himself is concerned, his remedy is extremely simple. A gas company is proud when it can abate the price by a few coppers; but this man, using 1000 feet of gas, has only to burn five times as much to secure an abatement of 2s. 6d. per 1000 feet.

I have treated the subject in relation to a charge for gas of 2s. per 1000 feet. No doubt there may be expediency in placing the water capital is high, in stimulating a sale under such conditions as I have dealt with; but even there the time may come when the evil will assert itself, and it is therefore better to begin as it is intended to proceed.

Meter-rents, in towns where the consumption of gas per customer is small, average about 2s. per 1000 feet. Their abolition would therefore necessitate an addition of a like sum to the price of gas; but the distribution of the amount would not be equitable—one-half the public, burning

only one-fourth of the gas supply, would profit to the extent of half the gross income from meters, which would be a saving to them of 4d. per 1000 feet; the other half of the public, burning three-fourths of the gas supply, would profit to the extent of 1½d.; and so the imposition of 2d. per 1000 feet on the price of gas all round, in lieu of meter-rents, would inflict an extra tax upon the large and profitable consumer of 3d. per 1000 feet.

This is certainly not the direction in which the interests of gas companies lie. It is manifestly to their best interests to sell gas in large quantities, and every abatement that can be made to the manufacturer is an inducement to him to apply it to new purposes; whereas in the other direction, the more restrictions are removed, the more unproductive becomes the field entered upon, until at length it becomes only a question of increasing loss.

Discussion.

Mr. HUNT said when he heard that Mr. Woodall had promised a paper for this meeting, he indulged in pleasing anticipations. Mr. Woodall had taught them to look to Leeds as the home, if not the fount, of economical principles as applied to gas supply, and his contempt of traditional management was well pronounced. When, therefore, the subject of the paper was stated, he felt sure that the abolition of meter-rents was about to be advocated. Consequently, his surprise was great when he found that Mr. Woodall not only defending what, in his (Mr. Hunt's) opinion, was one of the most indefensible of gas traditions, but resting his defence upon arguments that were, according to his (Mr. Hunt's) experience, of the most threadbare description. Mr. Woodall had brought before the meeting the case of the home-owners of the public, burning three-fourths of the gas supply, which they were burdensome to the large consumers, and adduced this fact as a reason why meter-rents should be charged. But then meter-rents were invariably levied upon the large and small consumers alike, without any regard to the amount of gas consumed. It was only by an accident that they passed upon those who consumed less than the sum of the least quantity of gas. The figures Mr. Woodall had quoted were not by any means new. He (Mr. Hunt) very well recollected that a similar statement was prepared some years ago for the late Birmingham Gas Company. At that time he was half inclined to believe in them himself, and he still believes in them, but he thought they seemed to justify a differential or minimum charge for gas. But to impose such differential or minimum charge in the shape of meter-rents was a source of vexation to consumers and a hindrance to the proper conduct of the business of a gas undertaking. He was inclined also to doubt whether the small consumers were really so great a loss as they have been represented to be. The example he gave of the utility for mains, where the small consumers were located all in one part, then it became a matter of calculation as to how far it would pay to extend the mains on their behalf. Such cases were of not unfrequent occurrence in the outskirts of large towns, and every case as it arose would have to be decided on its merits; but then it had to be remembered that the large proportion of the small consumers were to be found scattered all over the most populous parts of the district, in which the mains had already been laid for the supply to a presumably profitable class of customers. Consequently, in their case, the additional capital outlay was confined to services and meters. He would not see any greater reason for charging meter-rents than there was for charging rent for services. At one time it was, he believed, the practice to charge for laying on services; but this charge had come to be generally abandoned, except in the case of private services. It was not difficult to understand the origin of meter-rents. When gas lighting was first introduced, there were no such things as meters, and consumers were charged at so much per burner. In course of time the meter was invented, and at first was a somewhat costly apparatus. This equitable mode of assessment, however, was to be so great a convenience, that the public submitted to a charge which they had, with a few exceptions, borne for years, and hence ever since. He was of opinion that it was high time such an exceptional charge should be abolished, and meters looked upon as part of the ordinary stock-in-trade of a gas undertaking. He should much regret it if the opinions entertained by Mr. Woodall had gained ground.

Mr. MORLAND thought Mr. Hunt was right in saying that if meter-rents were abolished the difference was placed on large consumers. Some one must pay it, and if it was put on the gas, it affected large consumers most.

Mr. HUNT said a differential rate according to the consumption would be the right thing to charge. Let the differential rate cover the meter outlay as well.

Mr. DARWIN said some persons did not burn any gas in the six months of summer, while small consumers burned it all the year round. Others tried to have their meters sent in in the spring, so that they should not pay any meter-rent the summer, when they were not using gas. He thought the charge against small consumers was balanced by this fact.

Mr. LAYTON said that from the paper he read twelve or fifteen months previously, they would be well acquainted with his opinions on this subject. He had had to do with gas-rentals for twenty years, and was strongly inclined with the desirability of abolishing meter-rents, and charging meter-rents altogether. There were some injustices connected with the charge for meters. Take a case where 4s. each per quarter was charged for two meters, where a manufacturer did not use a particle of gas. Some times he (Mr. Layton) had to charge 8s. for meter-rent for registering 6d. worth of gas.

Mr. HUNT said that the advantage of abolishing meter-rents, and charging meter-rents altogether, would do away with the objections now made to the removal of meters where the number of lights had increased, and meters registered against a company. He had a difficulty too, at times, as to whether a wet or a dry meter should be put in, some consumers requiring the one, and some the other. He thought it would be well to abolish meter-rents, and let the cost of meters go in with the other capital of a company. He did not say it was practicable for every manager to go back to his company, and recommend this policy at once. Where a reduction, however, was being made in the price of gas, it would be easy to inflict 3d. on the large consumers, and take away the whole of the meter-rents. He did not think there would be any injury to gas companies from the abolition of meter-rents. He found more grumbling about these rents than about anything else. Persons who would be consumers would not become such on account of these charges, for when they were told that a certain sum was required for meter-rent they said they would not have the gas.

Mr. PRATT thought Mr. Woodall must look at this matter differently to most people, as gas was supplied at Leeds at the manufacturers price. Most companies, he said, went in for profit, and most of Mr. Woodall's arguments in favour of meter-rents would want to be remembered that in most places gas companies were getting for their gas 2s. more per 1000 feet than was charged at Leeds. There was another reason for doing away with meter-rents in regard to getting the right sized meters put in.

Mr. TAY said in his own case at Warwick there were a number of persons who provided their own meters, and in case the Gas Company allowed all consumers to have meters without charge, those who had

meters of their own would be in a false position, as they would have invested money in their meters while others had them for nothing.

Mr. MORLAND: But they put them up.

Mr. PRATT said his experience of small consumers was that they were not altogether honourable. They caused gas companies considerable difficulty in collecting their accounts, and gave more trouble than they were worth.

Mr. HUNT quite agreed with some of the speakers as to the desirability of abolishing meter-rents, his experience being that they were a nuisance. He sometimes had, he said, cases where a man had built two or three houses, and required 5-light meters fixed; but it was found that he proposed to have 20 burners put on, though he said he should never use them. If a 5-light meter was put up, and cost was carried out with the estimate, to have the gas at all. Such cases as this would be done away with by abolishing meter-rents, and so also would the difficulty where extra lights were added. He was so far impressed with the desirability of abolishing meter-rents that he had asked his Directors to look at the matter when they next considered the price of gas. Let gas companies do away with meter-rents, and have sole control over the meters, and it would be much to their advantage in the end.

Mr. LAYTON remarked, in reference to one point which had been raised, that in Redditch the Gas Company would buy the meters again if they abolished meter-rents.

Mr. STEVENSON thought the question was one which must be decided chiefly by the large undertakings. In smaller undertakings there were many things which were not quite ripe for the abolition of meter-rents. Supposing the principle was admitted in the case of large undertakings—as it had been in Leeds—how could it be carried out with the small consumers? Mr. Woodall was supplying gas cheaper than was being done by any other gas undertaking in the kingdom. If meter-rents had been done away with, he would not, perhaps, have been able to reduce the price quite so low as at present; but it might still have been the lowest charged anywhere. He (Mr. STEVENSON) was glad Mr. Hunt was in favour of abolishing meter-rents; the thing must be commenced by the large undertakings. If they considered small undertakings, where a comparatively high price had to be maintained, everything must first be done to reduce that price to reasonable proportions in reference to the prices charged elsewhere. Mr. HUNT observed that there were no meter-rents in Birmingham. Mr. STEVENSON said with regard to the small consumers, there was no doubt much loss incurred through them. In Peterborough the small consumers were chiefly publicans, and they were everlastingly running away and not paying their gas bills.

Mr. NORTH suggested that deposits should be taken.

Mr. HUNT said that if they did not run away they were continually changing, which resulted in loss, and not profit. It was the large consumers who required gas at a low price; the small ones, such as shopkeepers, must have gas, if they were to do any business at all. He would like to have meter-rents abolished, but it was a question if it could be done.

Mr. NORTH remarked that he did not think this was intended.

Mr. WOODALL said his purpose in writing the paper was to provoke discussion, and he knew the very exceptional position in which he stood, seeing that in Leeds gas was not charged by meter-rent. He thought it was proper to take into account the profit or loss from any given class of customers, but each manager, in his particular case, would vary those conditions, and apply the facts as he found them. He did not care where the gas was consumed, it cost about 8s. out of pocket to supply the small consumers. If they had a case like that mentioned by Mr. Layton, where a manufacturer used 1000 ft. of gas and had to pay 5s. for his meter, the hardship was not his, but the gas company's, and if the company had to supply two large meters without rent, the case would be more than ever hard upon them. Mr. Hunt was surprised that he (Mr. Woodall) should take the line of argument he had, and said the argument was in favour of proper take into account the profit or loss from any given class of customers. A manufacturer did not burn any gas in the summer months, and in winter time had his gas at the lowest price, when it cost more than it would if taken equitably through the year. The differential rate scarcely distinguished the unprofitable customer, who burned 5000 cubic feet, from a manufacturer, who was a most profitable customer, who burned 20,000 feet. He had never known cases in which the higher charge did not rage up to a consumption of 20,000 or 30,000 feet.

Mr. HUNT: 10,000 feet in Birmingham.

Mr. NORTH: That is quarterly.

Mr. HUNT: I was dealing with 5000 cubic feet per annum, and I say 10 per cent. of our customers do not burn 10s. worth of gas in a year.

Mr. MORLAND: At 1s. 10d. per 1000 feet.

Mr. WOODALL: Some consumers reduce their consumption to such an amount that it is not worth collecting even if the people did not run away.

Mr. HUNT: But you are supplying gas for the benefit of the public, whether they pay or not.

Mr. WOODALL: We go on strict commercial principles.

Mr. NORTH: Commercial principles mean profit.

Mr. HUNT: The commercial principle with the Leeds Corporation is the profit of the community.

Mr. HUNT: You pursue the policy of giving away all you have.

Mr. LAYTON: As to people not paying for gas, if they will not pay for gas they will not pay meter-rents.

Mr. HUNT: The only reason for such restriction to prevent waste of capital in regard to small consumers. I make a clear case of 8s. out of pocket in regard to the consumers I mentioned, much of it irrespective of consumption.

Mr. COLLETT: The cost of the services might be less by making one meter for the whole of the lot or two of the class of houses you name.

Mr. NORTH: That is a bad principle.

At the conclusion of the above-reported proceedings,

The President said the papers read that day had not fallen short of the high standard of the Association, and he had been gratified at meetings of the Association, and he proposed a vote of thanks to the gentlemen who had prepared and read them.

Mr. COLLETT seconded the motion, which was carried.

The President then said: We come now to the election of officers, and as I have the least opportunity I shall have of addressing you from the chair, I may as well thank you very much for the kindness and courtesy you have always exhibited in giving me your support. Feeling my inability to fill it as I ought, I very reluctantly took the position; but by your kindness and indulgence I have been able to get through my first year, and I hope the Association will not find anything to censure me in my presidency. I can only say I have increased very much in numbers. I am glad to notice a number of fresh faces here to-day, and shall be pleased to see even more in future. To those gentlemen who are here for the first time, I should wish to express what has always been my opinion, that the meetings of the Association are a meeting of brothers—a family meeting, where one can speak to his brothers, ask questions, and give information. This is the character the

Association has always taken from the first. Now we come to the election of President, and I take upon myself to ask you to support the gentleman I shall propose to fill that office next year. I have very great pleasure in proposing that Mr. Peterson, of Cheltenham, be elected. It will be an important year, as you are aware, in view of the visit of the British Association, to Birmingham, and I would impress upon you to do all you can to make that meeting a success. It lies with us very much, and I hope every member will assist the President and the Committee of our Association to make the visit a success, and then I have no doubt it will be. I take the greater pleasure in proposing Mr. Peterson as our President, for he is on the list of Vice-Presidents of the British Association, and we hope to see him President, and I think we cannot do better than place Mr. Peterson in our own presidential chair. I trust we shall still maintain our reputation, and I am looking forward to fresh laurels in the future.

Mr. HUNT said it was his hope that Mr. Simpson would allow himself to be nominated for President, but since he could not be he had pleasure in seconding the nomination of Mr. Peterson, and was sure the meeting could not do better than elect him.

The motion was carried.

The President then proposed that Mr. Tindall be requested to continue in office as Treasurer.

Mr. DARWIN seconded the motion, and it was carried.

Mr. WOODALL proposed the re-election of Mr. North as Secretary. He said he had observed his indefatigable conduct in the past. An Association of this sort called for a great deal of the energy which Mr. North had in his abundance.

Mr. STEVENSON, in seconding the motion, said that things had gone on increasing and flourishing under Mr. North's secretaryship—there had been elected as members at this meeting an increase over the former number of 20 per cent.

The motion was carried.

Mr. NORTH, in acknowledging the compliment, said he should always do his best to further the objects of the Association.

Two members of the Committee retired by rotation—Mr. Collett, of Dudley, and Mr. Darwin, of Portsea. In their places Mr. Hunt and Mr. Darwin, of London, were elected.

Mr. HUNT then proposed a vote of thanks to the retiring President.

Mr. HUNT seconded the motion, which was carried with applause.

The President acknowledged the vote, and proposed a vote of thanks to Mr. North for the very great energy he had placed at the service of the Association.

Mr. DARWIN seconded the proposition, which was carried by acclamation, and suitably acknowledged.

The members afterwards dined together at the Midland Hotel, and then proceeded by train to Oldbury Station, and thence to the new Albion Gas Works, near Birmingham. The works are situated on the site of the old W. Littlewood, the Manager, conducted them through the works, which are very extensive and complete in their arrangements. They first inspected the retort-house, then successively the meter-house, purifying shed, engine and exhauster house, and other parts of the premises. Messrs. Kirkham, the Engineer, and Mr. M. and Stevenson, the Engineer, and Mr. M. and Stevenson's assistants, are special features in the works, which were designed by G. W. Stevenson, C.E., the Engineer to the Commissioners. After going through the works the visitors partook of some light refreshment provided for them in the offices, and having drunk "Success to the West Bromwich Gas-Works and their Manager, Mr. Littlewood," the visit terminated.

GLASGOW GAS APPARATUS EXHIBITION.

COMPLIMENTARY DINNER TO THE EXHIBITORS.
On the evening of Monday last week the Executive Committee of the Glasgow Gas Apparatus Exhibition gave a complimentary dinner to the exhibitors and attendants, by way of recognizing the efforts which those gentlemen had made to contribute to the success of the undertaking. The meeting took place in the large Lecture Hall erected by the Committee and present about 100 persons. Dr. ASHLEY, President of the Philosophical Society, Glasgow, and Convener of the Executive Committee, occupied the chair; and Mr. JOHN MAYER, F.C.S., Superintendent of the Exhibition, and Mr. JOHN MANN, C.A., discharged the duties of the vice-chairs. The other members of Committee present were Mr. P. R.S.E., Sub-Convener; Mr. James T. Bottomley, F.R.S.E., of the University of Glasgow; Mr. John Vincent, Dr. C.E., F.R.S.E., of Dr. C. Glen, F.G.S.; Mr. Samuel Stewart, Greenock Corporation Gas Works; Mr. George R. Hislop, F.C.S., Paisley Corporation Gas Works; Mr. John L. Bruce, I.A., and Mr. Edward C. C. Stanford, F.C.S. The evening was an excellent repast of the kind.

The CHAIRMAN submitted the toast of "The Queen and the Royal Family," which was duly honoured. He next proposed "The Lord Provost, Magistrates, and Town Council of Glasgow—the Gas and Water Commissioners." He said the Committee of the exhibition were very much indebted to the municipal authorities—as the Gas and Water Commissioners—for their liberality in granting an unlimited supply of gas and water for the use of the exhibitors, without charge, a circumstance which greatly encouraged the Committee to go on with the exhibition. He also referred at some length to the Philosophical Society's exhibition, held in the winter of 1876-7, the surplus proceeds from which had served as the nucleus of the Glasgow Exhibition. He then proposed "The Gas Examiner for the city, had some claim to speak on the subject."

Dr. WALLACE replied. Speaking in the name of the municipal authorities, he said they had the very greatest pleasure in fostering the exhibition as much as they possibly could. While remarking that they had given the gas and water free, he at the same time did not believe they had the most remote idea as to the quantity of gas that would be consumed. They, however, looked to some profit arising from the exhibition through the increased demand for gas and water in consequence of a more general use of many of the exhibits. In several ways the exhibition had been a great success. So far as the number of visitors was concerned—though not prepared to give the figures exactly—he said it amounted to nearly 40,000, and although the money drawn, large as was the amount, would not perhaps be quite sufficient to pay their way, they hoped it would not be very far short of doing so.

Mr. STEWART proposed "The Philosophical Society of Glasgow," to which Dr. FERGUSON responded. He stated in the course of his remarks that there had been no fewer than 6395 gas connections in the exhibition, from which fact it might be possible to form some slight idea of the quantity of gas consumed.

Mr. STANFORD next proposed "The Health of the Exhibitors," and said he was glad that grumbling on the part of the exhibitors had been the exception and not the rule at the exhibition; and he expressed the hope that the exhibitors were as much pleased with the Executive Committee as the Committee were pleased with them.

Mr. WADDELL (of Glasgow), Mr. WILSON (of Leeds), and Mr. HERON (of Manchester) made suitable replies. Mr. Wilson expressed the hope that other exhibitors had done a satisfactory amount of business. He certainly

felt pleased with the measure of success which he had reaped, notwithstanding the fact that spring, rather than the autumn, was the best time for the makers of gas-stoves to do business.

Mr. MAYER, in submitting the toast of "The Gas Managers and Engineers of Scotland," felt that his experience as a Supervisor of the Exhibition, and the interest which he had taken in it from the first, would have almost warranted him in offering to speak in support of any one of the toasts on the list; but the one selected gave him an opportunity of informing the meeting of extensive patronage which the exhibition had received from gas managers from Scotland, England, and Ireland, as also from directors of gas companies, corporation gas commissioners, &c. Of the former he ran off from memory some 90 or 40, and he had no doubt that the list could be largely supplemented. He had further pleasure in submitting the toast from the opportunity which it gave him of referring to the valuable service given to the Committee by Messrs. Stewart and Hislop, with whose names he coupled the toast.

Messrs. STEWART and HISLOP made brief replies. The other toasts were—"The Jurors," proposed by the Chairman, and replied to by Mr. Day, who gave some interesting information regarding the testing of the gas motors; "The Electric Lighting Interest," proposed by Dr. Wallace, and replied to by Mr. Crompton; and "The Engineering Interests," proposed by Mr. Nelson, and responded to by Mr. Glen. The proceedings soon after were brought to a close.

NOTES FROM SCOTLAND. (FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The town of Hamilton, in Scotland, occupies a somewhat anomalous position so far as gas matters are concerned. Apparently the civic rulers of the place are anxious to do their very utmost to conserve all that is good for the inhabitants; but they fight a losing battle. In the first mode of conserving, the Council have published proceedings it is obvious that the Council contains men who have rather hazy conceptions of the precise meaning of the word "progress," while others, with an impetuosity more characteristic of youth than of "grave and reverend signiors," have been carrying everything before them—sweeping away the foundations of their predecessors' works, and building up new ones as they imagined, much forethought, built for the gas supply, and knocking down and scattering to the four winds the apparatus, ancient and modern, by means of which that gas was extracted from the coal. The question has been over and over again raised in the town, whether there was any necessity for works of such magnitude, and whether the great expenditure of the Corporation. On the one side, Mr. John Tainsh, who, as Convener of the Gas Committee, made himself thoroughly acquainted with all the minutiae of the manufacture of gas, stoutly maintains that the spending of £11,000 or £12,000 was an unnecessary outlay of public money, as all that was wanted to put the works on a level with the requirements of the town was to provide additional storage for the gas. But Mr. Tainsh goes farther, for he points to the miserable pittance which was given to the late Manager, and compares it with the existing state of affairs, and deduces from this a charge of recklessness against the Committee now in power. He thinks for no other reason than that the late Manager's institution, that the present Manager is paid too much, but rather than the previous stinginess of the Council had simply recoiled on their own head. Of course, he is met by a triumphant display of figures, to show that within the past seven or eight years the make of gas has almost doubled itself; jumping, as it has done, from something like 19 millions in 1874 to 35 millions last year. Whether this great increase is the result of the extensions, or whether the former supply was too stinted, does not plainly appear; but I am inclined to the opinion that the sudden introduction of populous suburbs within the parliamentary bounds of the burgh has everything to do with the increased demand for gas. The view of this dilemma, the civic rulers were justified in having ample means for the manufacture; and so far I do not think that Mr. Tainsh has any just cause of complaint; but when he accuses the Committee of rejecting a certain piece of apparatus the working of which had been proved to effect a considerable saving in the cost of the gas, he stands on firmer ground. It is pretty well known that the Aitken and Young analyzer was erected at Hamilton, in order to test the merits of the contrivance. The whole theory of the process, as Mr. Aitken once explained, is to keep the tars and gases separate as much as possible, or if they should come in contact, it would only be at the expense of the volume of gas. The heavy tars, which carry the downy films, the lighter hydrocarbons, which form, to a great extent, the light-giving portion of the gas. Some time after this apparatus had been erected, the inventor received assurances from the Convener of the Gas Committee that the analyzer was giving perfect satisfaction, and that it was effecting a saving of something like 20 per cent. This was only bearing out the report of the Committee of the West of Scotland Association of Gas Managers, who, after putting the analyzer to the most crucial tests, pronounced in favour of it, and their opinion was afterwards confirmed by Mr. Stewart, of Greenock, who thought it the best invention that had yet appeared for the purpose. It was not long, however, that Mr. Wallace, of Glasgow, who was of opinion that the process was an immense step in advance of anything that had been seen before. Here, then, is the opinion of the best gas engineers that Scotland can produce, and yet, despite that opinion, arrived at only after long and severe tests, it was thrown aside, and the gas was carried on in the old way, with all its disadvantages otherwise been the profession to which he belonged, did not know much about the physics of gas. The question is an all-important one, whether in actual practice the analyzer effects so large a saving in the manufacture of gas, as is claimed for it, and being convinced of his position, supported as it is by the fact that 6395 gas connections in the exhibition had been made, he brought his fellow-councillors to heel. Whatever advantage they may have over him in other respects, they have not yet given him any satisfactory answer on this count of the indictment against them. It is not the first time in the history of inventions that an uninformed community have disdainfully refused to accept of an improved machine, and have intended to advance the interests of special manufactures, and it is only charitable to suppose that want of knowledge rather than personal spleen has been the true cause of throwing the analyzer aside at Hamilton. The two Councillors who have done their worst on this question of gas manufacture are Councillors Tainsh and Baillie Cassels. Last week the respectable Baillie produced figures to show that the management for the year had resulted in a saving to the town of upwards of £700; and this week his "perpetrator" opponent—such is the description given, by the Baillie, of Mr. Tainsh—enters the lists, and publishes figures to show that during the past year there has been a saving of £5,000. But these are the figures of the Baillie. I should like to see the broader question as to the analyzer fought out.

Lochanbank, and other ground on the Blackwood Estate, have been leased to a Company who purpose working the famous Leamhagov canal coal. The field is thought to contain gas coal in such thickness of seams that it may pay the Company, and in this field operations are to commence at once.

Last week I made reference to the great scarcity of the supply of water for Greenock, and to the probable effect which the continued drought

would have upon the sugar refineries of the town. This week, owing to the very slight rainfall, it has been resolved to shut off the supply to the sugar refineries. Some idea of the terrible calamity which results from this resolution may be formed when it is stated that about 4000 men will be thrown out of employment.

While the people of Glasgow are looking forward with no small degree of anxiety to the future, the inhabitants of Kirkcaldy are wrangling as to whether an additional inch pipe shall be laid alongside the present one, and also as to whether a new reservoir, filters, &c., shall be made. The scheme which has been submitted to the Council this week is estimated to cost £30,000. As almost everybody in Scotland is aware, Kirkcaldy is the very hotbed of Radicalism, and some of the chiefs of that way of thinking have not been slow to lay it to the charge of the manufacturers that they are moving in this scheme from purely selfish motives; but the answer is that the manufacturers enjoy the greater part of the population of the "lang toon," and that therefore the benefit arising from an increased supply of water would be mutual. The recommendation of the Committee to prepare the necessary parliamentary notices to carry out the scheme has been approved by the Council.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

As a sequel to the announcement in this week's *Journal* regarding Mr. Levi Monk, late Gas Manager at Lanark, I may mention that his successor in that post has been appointed, the choice of the Directors of the Lanark Gas Company having fallen upon Mr. James Martin, who has been for about nine years past Gas Manager to the Kilmaleoch Gas Company. Before leaving Kilmaleoch to enter upon his new sphere of professional duty, Mr. Martin was entertained in the Buchanan Arms Hotel, on which occasion he was presented with a purse of sovereigns in recognition of his many good qualities.

The appointment of Manager to the Coatbridge Gas Company in succession to Mr. Robert Mitchell, who recently took service under the Glasgow Corporation Gas Commissioners at the Dawsholm works, has not yet been made. There were 41 applicants for the vacancy, and fully a fortnight ago seven of the most likely candidates were selected as a list. I understand that the works of these candidates have been visited by a Sub-Committee of the Coatbridge Directors, who are, I believe, in a position to name the man of their choice. The appointment is to be made early in the ensuing week.

In connection with the lighting of the Queen Street Station, the Glasgow terminus of the North British Railway system, there seems to have been a "game of cross purposes" amongst the Company's Directors. For a time it was confidently stated that the lighting was to be done with gas, and that Messrs. G. Bray and Co.'s system of flat flame burners and lanterns had been agreed upon, even to the extent of the exact number of the lanterns. Now, however, it has transpired that a contract has been closed with Messrs. R. E. Crompton and Co., of London, who have three powerful lights every night, the dynamo machines of the Gramme kind being driven by a portable engine, mounted by Messrs. Bell, Sons, & Co., Glasgow. The contract is said to be concluded at ten o'clock, per hour, Messrs. Crompton and Co. supplying everything. I believe I am right in saying that the gas-supply apparatus that would have been required for lighting the station was actually ordered from the before-mentioned Leeds firm. Something in the shape of a "shindy" is talked of in connection with this matter.

Referring to the Glasgow Exhibition of Lighting and Heating Appliances, &c., I may mention that there is a serious hitch in regard to the testing which the Committee of Jurors on Electric Lighting Appliances proposed to carry out with the four trials which apparatus was shown in operation while the exhibition was open. The proprietors of the "Macdonald's Light (Messrs. Strode and Co., of London) "struck their colours" before the actual closing of the exhibition. It, therefore, was soon "out of the running." Then, after the lapse of a few days the "Louth" system was withdrawn by Messrs. Latham and Co., of London, and, &c., the Engineers to the Electric Light and Generator Company. Lastly, the "Brush" Electric Light Company have had all testing suspended until further instructions are received from head-quarters. The Committee have spent a good deal of effort and technical skill on the Crompton exhibits, and the testing of the engine is to be continued shortly at the General Post Office here, where the Electric Light is also to be tried, the new premises being regarded as specially suitable.

On the question of the jurors work in connection with the exhibition, I may mention that the exhibitors in only four out of the ten sections in which the exhibits were grouped have yet received official information as to the results of the testing and adjudication—Gas Motors, Governors, &c.; Gas-Engines and Air-Engines; Hydraulic Appliances; Ventilating and Sanitary Appliances, &c.; and Safety Lamps, Mining Appliances, Fire-Clay Goods, &c. It has been the desire of the several Committees of Jurors to do their work most thoroughly, and hence the delay.

The Directors the Carlisle Gaslight Company have resolved to lower the price of gas to 4s. 7d. per 1000 cubic feet, commencing the reduction on the 1st of November. This is the lowest price that ever gas was sold at in Carlisle—a fact which speaks highly in favour of the management under the present Directors.

A comparatively small demand had been experienced in the Glasgow pig-iron market this week, with a large amount of business done daily. The closing prices on Friday afternoon were 51s. to 51s. 3d. cash in eight days, and 51s. 4d. one month, and the market closing nominally at 51s. 3d. cash.

The coal market is still showing signs of improvement, and prices are stiffening.

CURRENT SALES OF GAS PRODUCTS.

(FROM A MANCHESTER CORRESPONDENT.)

All gas products show a rising tendency, and appear certain to advance a little in price, with a prospect of fine business for some time. Rich in demand than it has been lately. All gas products used in the aniline manufacture appear likely to be in more demand. The following are some of the prices realized in recent sales:—

Tar, 38s. to 40s. per ton; prices advancing.
Eich, 15s. per ton; selling.
Ammoniacal liquor, sp. gr. 1.35, selling freely at 24s. per ton.
Ammonia sulphate (white), 41s 10s.; (grey), 41s 5s. per ton; demand increasing.
Chloride (best white), £44; (white), £40; (grey), £30 to £35 per ton.
Sulphur vitriol, 42 15s. per ton.
Muriatic acid, 27s. to 30s. per ton.
Oxide is worth 30s. per ton.

WINSLOW NEW GAS COMPANY, LIMITED.—This Company, which was registered on the 20th ult., with a capital of £5000 in £10 shares, proposes to construct gas-works for the purpose of supplying gas and gas products to the inhabitants of Winslow, Bucks.

ASSOCIATION OF MUNICIPAL AND SANITARY ENGINEERS AND SURVEYORS.

LANCASHIRE AND CHESHIRE DISTRICT MEETING.

The district meeting of the Lancashire and Cheshire branch of the above Association was held at the Swan Inn, Salford, on Monday, the 2nd inst., for the purpose of transacting the business of the Salford new sewage works at Weaste and to the Manchester Corporation Health Committee's depot at Holt Town. The members, of whom about 40 were present, assembled in the forenoon at the Swan Inn, Weaste, and then proceeded to the Salford sewage works, situated in the immediate neighbourhood. Here they were met by Mr. Arthur Jacob, the Borough Engineer, who, prior to conducting them over the works, gave a short description of the development of the sewerage system of Salford, and also of the new sewage works, to which reference was made in the *JOURNAL* a short time back (*ante*, p. 539).

Mr. Jacob, in the course of his remarks, said that in the year 1853 the question of dealing with the drainage of the borough of Salford first came under the consideration of the Council, and in that year Mr. Clement Trapp, their Surveyor, reported upon the matter, advising, amongst other things, that there should be an intercepting sewer to take up all the sewage which hitherto had run into the river, and to lead it to the site of the present works at Mole Wheel, Weaste. Mr. Trapp also recommended the construction of a tunnel from a point near the Peel Park, to carry away the Broughton sewage, but this work had never been carried out. Since the submission of the scheme other plans had been suggested by succeeding engineers, and the final result had been the construction of a trunk sewer, commencing at Mole Wheel, and following generally along the right bank of the River Irwell up to the Sherbourne Street Bridge, near which point the sewer passed under the river, then cut across an important loop of the stream, again passed beneath it at the top of Montague Street, and traversed the low flooded land lying between High Broughton and Pendleton. This sewer varied in dimensions between 8 ft. 9 in. by 7 ft. at the outfall to 3 ft. by 4 ft. at the upper extremity. In the year 1877, as the trunk sewer was proceeding towards completion, a scheme for dealing with the sewage at the outfall was projected by Mr. Alfred M. Fowler, the then Borough Engineer, and it was a modification of this scheme which has now been adopted. It was intended to treat the sewage by precipitation, and the scheme adopted by the Council was somewhat similar to that in operation at Leeds. There were arranged in duplicate six precipitating-tanks, making twelve in all. Each of the six reservoirs was a few inches below the tank immediately above it, so that the sewage would flow from one tank to the other, and the water which it would pass away comparatively purified, or, at any rate, free from suspended matter. As first designed, the tanks would have occupied the lowest ground, presumably in order that the lift of the sewage should be reduced to a minimum, which was a necessary and advisable provision, if, as was at first intended, the sewage was to be pumped up to the tanks. Mr. Jacob advised that the precipitating-tanks should be placed on the highest part of the site. The tanks were 113 feet long, with an average width of 78 feet. They had a total area of 102,357 square yards, and their cubic contents when full would be 720,000 cubic feet. Sewage was diluted at the most remote of the precipitating tanks, and the diluted water, flowing into the mixing-houses, was used to drive a pair of turbines which actuated the mixing machinery, and to raise water for employment in the process. Thus to some extent the power of the pumping-engines was made available. The engines to be employed were of the compound vertical type.

The plans were then conducted over the works, and the details of the process explained by Mr. Jacob. The work has been in progress for two years, and it is expected will be completed in the course of another twelve months. Salford, which has taken the lead in the district, in dealing with sewage before employing the system of Mr. Irwell, the present polluted state of which is well known, will then possess one of the most complete systems of the kind in existence in the kingdom.

On returning to the offices a number of questions were put to Mr. Jacob, and some discussion arose as to whether time was the best material to use for the tanks. Some members mentioned that they had met a man who could not be found, and Mr. Jacob said he was not quite sure that it was really the best, but it had been found to do its work very well. The President, Mr. Alfred Morant, Borough Engineer of Leeds, then proposed a vote of thanks to Mr. Jacob, which was unanimously accorded, and the arrangements for the meeting of the Association at the end of the year were being re-elected Honorary District Secretary for the ensuing year.

A number of the members afterwards proceeded to the Manchester Corporation works at Holt Town, where they had an opportunity of inspecting the process of converting the nightsoil of Manchester into a native guano fertilizer. The works are situated on a large tract of more than 100 acres, and have been erected at a cost of more than £90,000. In Manchester there are about 60,000 dry-ash closets, so arranged that all the liquid and solid excrementitious matters are deposited in a pail, and automatically covered with a small quantity of fine ashes. The pails, as well as the rubbish from the dust-bins, are removed in vehicles specially fitted for the purpose, and conveyed to the works, where the contents of about 40,000 closets, consisting of 1000 tons of rubbish, are dealt with each week. The contents of the receptacles are here poured into a machine which separates the feces from the foreign matter, the latter being used as fuel, and the former, during its progress, is pressed into a fine granulated state, and is converted into a finely-granulated manure, which is sold at £3 per ton. Of this manure 42 tons are made daily, and the other rubbish after having done duty as fuel for the boilers, and been converted into clinkers, is ground with lime in powerful mills and converted into mortar.

The visit to these works closed the day's proceedings.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is a decided strengthening of the market here so far as all the better qualities of round coal are concerned, and throughout the Wigan and neighbouring districts an advance of about 6d. per ton is being obtained in the pit price of Arley and Pemberton four-foot coals, the best qualities of which now average about 5s. 6d. and 7s. per ton respectively. In the Manchester district there has been a further upward movement in the delivery rates of domestic coal to the extent of about 10d. per ton; but the pit prices are not yet materially altered, as some of the large firms have heavy stocks which they are anxious to clear away. It is, however, still only for house-fuel coals that any real advance is being obtained, other classes of fuel for manufacturing purposes being offered at about late rates.

In gas-making calls there is about the ordinary business doing for the season of the year, which is chiefly confined to small quantities for private consumers. For best screened Wigan Arley gas coal 7s. to 7s. 6d. per ton at the pit is quoted, but common Wigan coals are being bought as low as 5s. to 5s. 6d. per ton at the pit. Common round coal for steam and large purposes does not yet meet with any materially increased demand, and 5s. to 5s. 6d. per ton at the pit is about the top price for this description of fuel. Burgundy is getting rather scarce, but slack is becoming rather

a drug, and there is a slight giving way in prices in some cases. Good burry at the pit is quoted at 4s. to 4s. 6d., and good slack at 3s. to 3s. 6d. per ton.

Shipping has been very quiet, and common round coal is still being offered for delivery at the High Level, Liverpool, at as low as 6s. 6d. per ton.

The iron trade there has been a good deal of buying going on for forward delivery, and the further sellers are prepared to go into next year, the larger the quantity of iron they can sell; but there is no demand for prompt delivery. Lancashire makers of pig iron are selling up to the end of March for delivery equal to Manchester at 46s. 6d. to 47s. 6d. per ton, less 21 per cent., and lower bars are offered at about 45 15s. to 46 per ton.

Pipe founders are getting rather busier, but low prices are still quoted.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

The shipments of coal at Cardiff during the past week were very satisfactory, and no change was experienced with regard to price. The quantity of coal shipped at that port was 92,776 tons, and at Newport 17,988 tons. However, this does not represent the respective capacities of the two places as shipping ports, the latter town possessing a large reserve of power in its extensive Alexandr Dock, the basin of which covers a superficial area of 23 acres. The number of tons shipped will probably be double what it was at the same time last year, the Great Western, Newport, Pontypridd, and Cernphilly Railway, now in progress, is completed.

There is one rather peculiar feature which I should like specially to note in respect to our local trade—namely, that while tin-plates do not advance, tin itself commands a stiff price, and this would seem to indicate that the iron which is the other element in tin-plates is in low supply. I may say the same for steel. A large steel-works, which during the whole of the depression was in full swing, is now nearly idle. A third point which I note from my own observation is that a local company, who have a considerable line of railway to lay, have been recommended by their responsible advisers to purchase iron at a price of 45 15s. to 46 per ton, and command high prices, at least in this locality, and I would give a hint to all in the gas world who have sidings to lay, that they will never find a more favourable opportunity than the present for buying rails.

The new tin-works at Cwmavon, which have been for some time in construction, having now been completed, the first batch of six iron was rolled last Wednesday morning. The building was used some years back as a rail mill, and is very extensive. There are now in full work 16 furnaces which will, it is estimated, consume 50 tons of coal daily. About 80 men are engaged at these works, and this, with the extra colliers and other employees throughout the valley in connection with the undertaking, will be in probably an increase of the amount of wages paid monthly by £1000. It is the intention of Mr. J. Shaw, the proprietor of the works, to shortly commence the manufacture of tin-plates, for which purpose mills will be erected.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

It is generally admitted that the state of the coal trade in the South Staffordshire district is improving. At least, so far as is shown by the business transactions of the past week or two, things have taken a better course. Though most notably in the domestic coal business, yet other qualities are alike receiving a greater demand. A fair quantity of orders have been placed in the district for forge and furnace consumption, and inquiries, too, for this class of fuel are said to be considerably more numerous. Household qualities are most in demand from the Cannock neighbourhood, where, too, an advance of 1s. per ton has been decided upon. In this particular branch of the trade an increase of rates has been looked upon as a certainty for some time past, but there are but slight indications that a like increase will be made on any of the other different classes of fuel. Gas coals are fairly inquired after, but stocks are still plentiful, and at most of the pits where the contributions to the supply are a characteristic of the men are making more than the iron and other products of the domestic fuel, of course, excepted. For the rough and common qualities there is also an improved demand. As compared with the state of trade in this district twelve months ago there is a decided outlook for the best. The principal features, however, are the improved demand for domestic fuel, and a slightly growing market of iron-making fuel of all classes. Common, the market is well stocked, but prices are firm on account of a fairly existing demand.

The business transactions in the iron trade have somewhat improved during the past week, so far as finished iron is concerned. Several good orders have been placed in the district, and these have had the effect of slightly increasing the rates of a week ago. Quotations for medium qualities of finished iron are 2s. 6d. per ton higher. Best bars are steady at £7 10s., and common at 46 10s., though a few sales in bulk have been made during the week at prices as low as £5 10s. A more cheerful tone also prevailed at the Birmingham Exchange on Thursday, and orders were placed in the district. For second quality iron, the local market, but chiefly for sheets, bars, hoops, strip, and rod, inquiries were numerous. The pig trade is scarcely so good, nevertheless the orders given were for quicker delivery than is usually asked. The number of furnaces in blast has again slightly decreased, and at the present time there are but 45 in work. The quantity of iron, and it is satisfactory to note that the stocks are not increasing. The export trade is still unmarked by any feature of importance, the majority of sales effected being for local consumption. Makers of girder and bridge work are well employed, as also are galvanizers and tube makers.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Since my last notice a still further improvement has taken place in the ordinary coal trade in both South and West Yorkshire, so that at many places full time is being worked. The pits in the North Yorkshire, and the few districts are very well supplied with coal, and the same is the case in West Yorkshire. The Silkstone and Barnsley thick-meat pits are at an active business; yet, strange to say, the tonnage by the Great Northern line has not been so good as might have been expected, but the Midland had an increase last week. The export is just now an active demand for domestic coal for the Eastern Counties, and in some instances the supplies are not equal to the demand. Prices have increased, but in few instances they exceed 15s. per ton.

Steam coal is in not nearly so good request as it was a short time ago, and it is feared that, when the northern ports are closed, business will be very moderate indeed. The export is usual at this period of the year, are falling off, yet orders on account of existing contracts are being pushed forward.

On the whole, a large tonnage of coal suitable for gas-making purposes is being raised, more especially at the South Yorkshire pits. Some of the colliers in the Ribblesdale district are using this coal to secure some good contracts for supplies to the Midland gas companies.

Other descriptions of fuel are in moderate request, but prices continue low, and for some kinds sales have to be forced. The usual supplies of locomotive coal are being forwarded to the various railway companies, and some of the pits have a fair inquiry for manufacturing coal. The coke trade is active when the large output is taken into account. A fair quantity is consumed at the local furnaces, but by far the largest tonnage is sent to other smelting districts, North Lincolnshire taking the lead.

Taken as a whole, there is but little new to note respecting the iron and steel trades carried on in the county. The output of pig iron continues to be fully up to the average, whilst stocks are not over large. Generally speaking, the foundries are badly off for work, as are also machinists. Most of the lesser smelter, mills and fires continue to do a good business, and most firms engaged in wagon building and repairs are much better off for work than they were a month or two ago.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The shipments of gas coal by steamer were very large last week. Boats had been sadly thrown out of their regular courses by the fearful weather of the previous week, and most of the turn steamers lost a voyage. There has been no such storm for at least a quarter of a century; and that some of the smaller steamers may have been put out of the trade by a short supply of coals, it is highly satisfactory to note that to not one of the large fleet of steamers engaged in the gas coal trade to London and elsewhere happened any disaster in the hurricane, and that as soon as the weather moderated the trade was in full vigour again. The whole of the coal supply of the district is a fair one, and the supply of gas coals are very well employed. They will continue to be so, no doubt, until the end of April. Prices remain about the same. For the reasons stated in this column from time to time, it is probable there will be very little change in them over the winter. Steam coals are doing poorly, and the manufacturers of gas are doing very much better. Consumption has increased, there is still more production than there is demand. The coke trade is in a better position in the market, in regard to increased consumption at the iron-works and for shipment.

Small sailing vessels are scarce, and, on account of recent heavy losses at sea, they will be so over the winter. But steamers are coming out of the Baltic trade rapidly, and the upward tendency of freights coastwise will be thus checked in two directions—first, by a better supply of steam tonnage and through railway competition. The rate paid to steamers to load coals to London last week was 4s. 6d. per ton, large steamers.

The business doing in the manufactured iron and steel trade. Foundry work is doing well in the Tyne. The fire-clay and firebrick trade with the Baltic is being rapidly brought to a close for the season. The fire-clay and cement trade of the Tyne is dull. Cement is in poor demand. Lead is weak. Copper has become steadier. The timber trade is quieter in all its branches. Chemicals go badly, and are not likely to be any better this year. They are as low in price as in the worst times of depression.

REDUCTION IN THE PRICE OF GAS AT DEAL.—The Deal Gas Company have reduced the price of gas 10d. per 1000 cubic feet—from 5s. to 4s. 2d.

DORCHESTER GAS-FITTINGS COMPANY, LIMITED.—A company under this title was registered on the 23rd ult., with a capital of £850 in 10s. shares, to manufacture and supply gas-fittings.

FYLDE WATER-WORKS COMPANY.—The half-yearly general meeting of this company was held on the 27th ult.—R. Dunderdale, Esq., J.P., in the chair. The Directors report which was presented stated that the expenditure on capital account had been increased during the half year by £922 3s. 2d., and amounted to £178,736 3s. 1d. The amount received for water for all purposes and for profit on fittings, during the half year was £745 5s. 10d.; less interest on loans and commission, £749 15s. 11d.; working expenses (including rents, rates, and taxes), £1843 3s. 3d.; and allowances for empty houses and bad debts, £370 17s. 8d.; leaving a balance of £4473 8s. The number of consumers had increased by 498, and now amounted to 7385. The Dividend for the half year was 10s. 6d. per share, and the stock at the close of 41 per cent. per annum, free of income-tax, and that the balance of about £1060 be carried to the reserve-fund. The report was adopted, and the proceedings closed with the usual vote of thanks to the Chairman.

THE WATER SUPPLY OF BINGLEY.—A meeting of the ratepayers of Bingley to consider the question of applying for an Act to amend the Bingley water supply and of water for the town was held last Wednesday. The chair was occupied by Mr. T. Eckroyd, Chairman of the Bingley Improvement Commissioners, who, after reading some correspondence which had passed between the Bradford Corporation, the Commissioners, and Mr. W. B. Fernand, proposed that the suggestion of the Commissioners should be adopted, and that proceedings should be instituted forthwith to obtain an Act of Parliament. The Town Clerk of Bradford (Mr. W. T. McGowen) laid before the meeting certain facts to show that the Commissioners could not possibly obtain the proposed Act without the sanction of the Bradford Corporation. In the course of the proceedings, Mr. Fernand proposed a scheme of water supply, and the Chairman of Mr. E. Fittler, C.E., of Leeds, would cost about £55,500. The motion was eventually carried.

THE GAS SUPPLY OF BARNSELY.—A meeting of the inhabitants and ratepayers of Barnsley, convened by the Mayor, was held on Friday, the 26th ult., for the purpose of considering the question of purchasing the local gas-works. The following resolution was carried: "That the Mayor, in the course of this meeting, the time has now arrived when steps should be taken by the Town Council to purchase the Barnsley Gas Company's works, if such can be obtained on equitable terms;" and—"That this meeting respectfully requests the Town Council to take the earliest opportunity of applying to the Local Government for the purchase of the works, and to the Mayor, an Alderman and a Councillor of the borough—expressed their belief that the works could be obtained "on fair and equitable terms;" but notwithstanding this, the following motion, of the nature of a threat, was subsequently agreed to:—"That in the event of the Town Council not being able to come to terms with the present owners in the gas-works, we, the burgesses, strongly recommend them to take immediate steps to obtain parliamentary powers to erect new works."

STOCKTON AND MIDDLESBROUGH CORPORATIONS WATER SUPPLY.—The Leeds Mercury of the 5th inst. says: "Yesterday another of a series of private meetings was held by the Stockton and Middlesbrough Corporations Water Board. The object of the meeting was to consider the price to be paid to the Corporation for additional powers to enable the Board to construct new works proposed by a scheme submitted by Mr. Mansergh, C.E., London, which would embrace the erection of a large reservoir at High Force on the Tees, and other works in connection with the supply of water for Stockton and Middlesbrough and the neighbourhood, and which would involve the expenditure of £29,000. The Board discussed the report of a geologist, who pointed out the inexpediency of

making a reservoir at High Force. After an hour's conversation, it was agreed to abandon the scheme, and to recommend the Stockton and Mid-diesbrough Corporations not to proceed with the proposed application to Parliament at present. It is the intention of the Board to carry out extensions under their Provisional Order as they may be needed."

SHOREHAM WATER-WORKS COMPANY.—The ordinary half-yearly meeting of this Company was held on the 30th ult.—Dr. Fuller in the chair. The report presented by the Directors stated that during the previous half year services had been laid to 135 additional houses, producing an annual rental to the Company of £125. The profit and loss account showed a net profit of £458 7s., which would be more than sufficient to pay a dividend at the rate of 5 per cent. per annum on the total amount of capital authorized by the Shareholders, this profit having been earned almost entirely by the old business of the Company. The new works were nearly complete, the two service reservoirs were finished, and the new pumping machinery was fixed, so that the Directors were prepared to supply the new district of Portlady Village, from which they expected a substantial return. The balance of profit and loss account admitted of a dividend being paid of 5 per cent. for the half year on the original shares, and the sum of £150 being carried to the reserve-fund; and the Directors recommended that such balance be so disposed of, leaving £150 2s. 4d. to be carried forward to the next account. The report was adopted, and the proceedings closed with a vote of thanks to the Chairman.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 4408.—**NAWMOCK, G. W. von, Berlin**, "Improvements in photometers." A communication. Oct. 28, 1880.
 4419.—**BENSON, M., Chancery Lane, London**, "Improvements in gas-engines." A communication. Oct. 29, 1880.
 4444.—**LAKE, H. H., Southampton Buildings, London**, "Improvements in electric gas-lighting apparatus." A communication. Oct. 30, 1880.

4487.—**KENNEDY, T., Kilmarnock, N.B.**, "Improvements in water supply apparatus, such as is known as 'wells' or 'drinking fountains.'" Nov. 3, 1880.

4520.—**STEVENSON, J. S., Dublin**, "Improvements in apparatus for the distillation of ammoniacal liquor." Nov. 4, 1880.

4528.—**MACDONALD, J., Queen Victoria Street, London**, "Improved means of and apparatus for increasing the illuminating power of coal gas." Nov. 4, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2055.—**SUOC, W. T., Westminster**, "Improvements in railway carriage lamps, and in the means of supplying illuminating gas thereto." May 21, 1880.

3261.—**MELLING, T., Aigburth, Lanes**, "Improvements in water meters or motors, or apparatus for measuring and registering the quantity of water or other fluid flowing through pipes or other conduits, which improvements are also applicable to other hydraulic purposes." Aug. 10, 1880.

3436.—**LAKE, W. R., Southampton Buildings, London**, "Improvements in fluid meters." A communication. Aug. 24, 1880.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £20 BEFORE THE EXPIRATION OF THE THIRD YEAR.

- 3956.—**JOHNSON, J. H.**, "Improvements in hydrants." Oct. 25, 1877.
 3960.—**QUAGLIO, J. von**, "Improvements in purifying coal gas from bisulphide of carbon and other sulphur compounds." Oct. 27, 1877.
 3992.—**WIRTH, F.**, "Improvements in apparatus for and in the treatment of ammoniacal liquids." Oct. 29, 1877.
 4028.—**HUGHES, E. T.**, "Improvements in pumps." Oct. 30, 1877.

PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

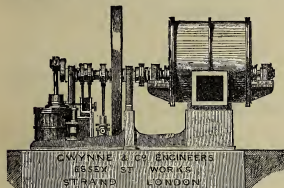
- 3457.—**WEEMS, W.**, "Improvements in apparatus or means for lighting and ventilating." Oct. 24, 1873.

The **GRAND MEDAL OF MERIT** at the **VIENNA EXHIBITION**. **TWO MEDALS** at the **PHILADELPHIA EXHIBITION** and **TWO MEDALS** at the **PARIS EXHIBITION**, have been **AWARDED** to **GWYNNE & CO.** for **GAS-EXHAUSTERS, ENGINES, and PUMPS**; Also **27 OTHER MEDALS AWARDED** at all the **GREAT INTERNATIONAL EXHIBITIONS**.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



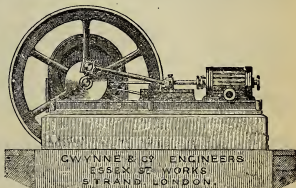
EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas **WITHOUT OSCILLATION OR VARIATION** IN **PRESSURE** Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.,** Hydraulic and Gas Engineers, **ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.**

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.



52,500 EXHAUSTER, with Horizontal Engine combined.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,

WITH

Wrought-Iron Spindles and ENGINES COMBINED.

SOLE MAKERS,

GEORGE WALLER & CO.

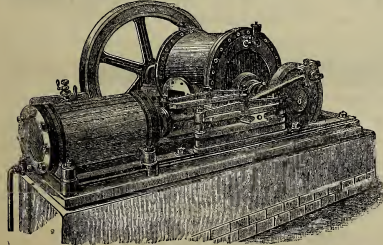
MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[SEE ALSO ADVERTISEMENT, PAGE 750.]

Phoenix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.



WANTED. Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, **MORTON OAKES, Assoc. M.I.C.E., Gas-Works, SYDENHAM.**

WANTED, by the Advertiser, a Young Man, aged 27, an Engagement in a Gas Company's Office, Assistant Engineer, or Clerk of Works, &c., has had every experience in a Gas-Works. First-class testimonials and references.
Address No. 695, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Young Man (married), a situation in a Gas-Works. Is the son of a Manager, and is a good Man and Serviceable. Can do any fittings in the Retort-House; can also Fix and Read Indexes of Meters, and has had experience both at Laith and Vice. Very fit-able.
Apply to the MANAGER, Gas-Works, Croyford, Kent.

WANTED, by the Advertiser, a Situation as CARBONIZING FOREMAN of a large Gas-Works, or WORKING MANAGER of a small Works. Gas Lay Mains and Services, Read Meters, &c. In the general routine of a Gas-Works. Good testimonials. Address No. 700, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED.—The Advertiser, a Young Man, aged 39, married, is open for an Engagement as MANAGER and SECRETARY of a medium-sized Gas-Works, or SUB-MANAGER of a large Works. Has a thorough knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Main Works for 16 years. Highest testimonials and references.
Address No. 678, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Advertiser, a Young Man, aged 33, is open for an Engagement as MANAGER and SECRETARY of a medium-sized Gas-Works; or SUB-MANAGER of a large Works. Has a knowledge of the Manufacture and Distribution of Gas in all its branches, having had the management of Gas-Works for some time. Highest testimonials and references.
Address F. S., Gas-Works, WIDNAN.

WANTED, in a small Country Gas-Works, a WORKING MAN who has been accustomed to take charge.
For particulars apply, with reference, to the SECRETARY, Gas Company, SEVENING.

MAIN AND SERVICE LAYER.
WANTED immediately, a Main and SERVICE LAYER for a Gas-Works in South Wales. A permanent engagement to a steady, experienced.
Address, with all particulars, No. 699, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ACCOUNTANT WANTED.
WANTED, by a Gas Company in the Provinces, an Experienced ACCOUNTANT, who understands Book-keeping by Double Entry, on the most approved principles; also the Preparation of the Annual Balance-Sheets, and the routine of an Office. Salary £100 per annum.
Applications to be made, in own handwriting (and the highest references required), to No. 698, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, to Lease Gas-Works Highest References.
Apply, by letter, to No. 696, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED to Purchase, a New or Second-hand LIVESEY'S SCRUBBER suitable for small Works making about 7 million cubic feet per annum.
Address, with price and particulars, to Mr. JOHN CLARK, Gas-Works, HESSLE, near HULL.

AMMONIA PLANT FOR SALE.
A COMPLETE Plant in thorough working order, to make up to 15 tons daily; or Saturator and Crystallizing Pans will be sold separately. Also Cornish and other Boilers, Rail Stills, Hydraulic Press, Iron Tanks, Tangye's Pumps, &c., for Sale, and Waterside Premises to be Let.
Apply to T. V. CLARKE, on the premises, Trundley Lane, Surrey Canal, DEPTFORD, S.E.

FOR SALE.—A Purifier, 10 ft. square, 4 ft. deep, 10-in. Inlet and Outlet.
One 10-in. Centre-Valve for working four purifiers.
Two 6 ft. by 5 ft. Circular Cylinders.
One Lifting Screw for Purifier Lids.
A Condenser complete, with cast-iron Boxes, a double row of 10-in. Pipes, 3 in. each row, and about 35 ft. high, with 10 in. Inlet and Outlet, Connections, and Bye-pass, and three 10 in. Valves.
All the above are in capital condition. Also a quantity of Old Iron.
For further particulars, apply at the Gas-Works, Bromley, Kent.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS REPORTS for 1869, 1870, and 1876.
The Institution of Civil Engineers require the above-named reports in order to complete their set.
Any one, having copies to spare of any or all of the three, will oblige by communicating with the Secretary of the Institution,
JAMES FORREY,
25, Great George Street, Westminster, S.W.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

(INCORPORATED BY ACT OF PARLIAMENT.)
The HALF-YEARLY ORDINARY MEETING of this Association was held at the City Terminus Hotel, Cannon Street, London, on Tuesday, the 30th of June last, and a bonus of £1 per cent., and that the said dividend and bonus be payable, free of income-tax, on and after the 1st of December next.

Resolved unanimously—"That the Report upon the affairs of the Association be received, adopted, and entered on the minutes."

Resolved unanimously—"That a dividend of £5 per cent. be declared upon the £2,800,000 capital stock of the Association for the half year ended the 30th of June last, and a bonus of £1 per cent., and that the said dividend and bonus be payable, free of income-tax, on and after the 1st of December next."

Resolved unanimously—"That the cordial thanks of the meeting be given to the President and Directors, for their able management of the affairs of the Association, and to the Chairman for his conduct in the chair this day."

Upon the motion of the Chairman (Sir Julian Goldsmid, Bart.) a vote of thanks was also given to Mr. L. G. Drury, and to the Agents, Engineers, and other Officers of the Association.

By order of the Board,
S. S. GARRETT, Secretary.
30, Clements' Lane, Lombard Street, E.C.,
Nov. 3, 1880.

FOR SALE.—One 7-in. Gas Governor,

with 7-in. Valves and Bye-pass complete; in good condition. Offers wanted.
Apply to W. WINDWOOD, Gas-Works, ICKLEY.

THE Gloucester Gas Company have the

undermentioned APPARATUS for Sale:—
About 150 feet of D-hape Wrought-Iron Hydraulic Main, size 18 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 30 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.
Exhauster (Boles) to pass about 15,000 feet per hour.

Two Vertical Steam-Engines, each about 4-horse power, with Pulley, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.
Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.
Gasholder, Double Lift, capacity 300,000 feet.
One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.
Two 12-in. four-way face Valves, by Cockey.

For further information, &c., apply to the undersigned,
B. MORLAND, Engineer.

TAR CONTRACT.

THE South Metropolitan Gas Company invite TENDERS for the Surplus TAR, about 700,000 gallons, from their Redhill Station for the year 1881. Particulars may be obtained on application to the undersigned.

Tenders to be sent in by Wednesday, Nov. 17.
By order of the Board,
GEORGE LIVERSEY, Secretary and Engineer.

TENDERS FOR PIPES.

THE Nelson Local Board Gas Committee invite TENDERS for the following PIPES, 9 ft. long, turned and bored joints, with a cavity for lead:—
Lot 1.—100 10-in. Pipes and 100 6-in. Pipes.
Lot 2.—200 14-in. Pipes.

The two lots to be tendered for separately and together. Pipes to be delivered at Nelson Station, Lancashire. For further information, apply to
WILLIAM FOSTER, Manager.

MALTA.

LIGHTING BY GAS VALLETTA, FLORIANA, MARSA, SEN/LEA, COSPIQUA, & VITTORISSA.

SEALED Tenders will be received at this Office until noon of Monday, June 3, 1881, for Lighting by Gas the Streets of Valletta, Floriana, Marsa, Sen/Lea, Cospiqua, and Vittorissa, for a period of Ten Years, to date from May 15, 1882.

Tenders to be on the established printed form supplied by this Office.

The conditions of the contract and further particulars will be made known on application to this Office.

Each tenderer will be accompanied with a deposit of £200, which sum it is to be temporarily retained with the Receiver-General, to be dealt with as stated hereunder; and no notice will be taken of any tender unless the due fulfillment of the conditions be found endorsed in favour of that Officer.

The deposit thus made shall be forfeited in favour of Government should the party tendering, or the surety, fail to appear for the stipulation of the requisite contract in the event of the tender being accepted, within three days from the day of the notice given to him to that effect.

The deposits of the unsuccessful tenderers shall be returned to them immediately after notice will have been given to the party whose tender will have been accepted. Any notional fees will have to be paid by the Contractor. The undersigned retains the power of accepting or rejecting all or any of the tenders received.

C. BARNES,
Acting Auditor-General and Director of Contracts, Valletta, Oct. 7, 1880.

TAR PLANT.

SPECIFICATIONS and Tenders are in. invited for the supplying and Erecting of APPARATUS complete for a small TAR-WORKS.

Particulars on application.
The Company do not bind themselves to accept the lowest or any tender.

JOHN J. JERVIS, Manager.
Swindon New Gas Company, Limited.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Halstead Gas Company, Limited, invite TENDERS for the Purchase of the Surplus TAR and LIQUOR produced at their Works from Jan. 1, 1881, to Jan. 1, 1882. Quantity of coal carbonized about 1000 tons.

Further information may be obtained on application to the Manager.
C. B. BROWN, Manager.

TO TAR AND AMMONIA DISTILLERS, &c.

THE Directors of the Redhill Gas Company are prepared to receive TENDERS for the Surplus TAR and AMMONIACAL LIQUOR produced at their Works for One, Two, or Three years, from Jan. 1, 1881, or such other terms as may be agreed upon.

Particulars respecting quantity, &c., may be had on application to the Manager, at the Works, Redhill, Surrey. Tenders to be delivered or sent, as to be at the Gas-Works not later than Tuesday, the 30th inst., and endorsed "Tender for Surplus Tar and Ammoniacal Liquor."

By order of the Board,
C. J. D. Manager and Secretary,
Gas Office, Brighton Road, Redhill, Surrey, Nov. 6, 1880.

MR. W. H. ALLEN begs to advise the public that he has resigned his appointment he has held for the past twelve years, as Manager to the firm of Messrs. Gwynne and Co., the Hydraulic and Mechanical Engineers, of Essex Street Works, Victoria Embankment, London; and has taken the Engineering Works lately occupied by Messrs. Merryweather and Sons, in York Street, Lambeth who have removed to larger premises at Greenwich, where he has commenced business as a manufacturer of Special Machinery of the best London make.

He has taken into partnership Mr. Richard Wright, who occupied a position under him for many years at the above works.

The style of the firm will be W. H. Allen and Co. York Street Works, Lambeth, S.E., Nov. 1, 1880.

JOHN HALL AND CO., STOURBRIDGE, Manufacturers of FIRE-BRICKS, LUMPS, TILES,



FIRE-CLAY GAS RETORTS.

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

Now ready, Second Edition, price 7s., by post 7s. 3d., the
GAS MANAGER'S HAND BOOK.

By THOMAS NEWBIGGING, M.I.C.E.

Orders to be sent to
WALTER KING,
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TO CORRESPONDENTS.

ONE WHO WOULD LIKE TO KNOW.—Your inquiry should be addressed directly to the gentlemen you name.

F. AND O.—No reference having been made to you, in the report to which you call attention, letter can only be inserted as an advertisement.

J. H.—Will look over the figures sent in reference to the South Australian Company's supply, and have no doubt shall find something interesting to extract for JOURNAL.

M. P. B.—Why did you not send report before? The date of it (Aug. 19) will prevent reference being made to it in our columns unless something very special is noticeable on looking it through, which shall be done in the course of the week.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 16, 1880.

Circular to Gas Companies.

A CASE of great importance, bearing on the relations between Highway Authorities and Gas Companies and others having the right of laying pipes under the surface of roads, was tried at the Thames Police Court on Tuesday last. We shall give next week a full report of the proceedings, which are highly interesting; in the meantime, the facts may be shortly stated as follows:—The Surveyor to the Vestry of Mile End Old Town, on behalf of the Vestry, summoned The Gaslight and Coke Company for neglecting to reinstate a certain road which had been opened by the Company in September last, for the purpose of examining the joints of their gas-main, and making good leaks in the same. The holes dug for this purpose were about eight feet long by six feet wide, and were necessarily only a few feet apart. The road had been repaired and macadamized by the Vestry during the past summer, and the surface finished off by a steam roller. It was now contended that the Company, being liable to reinstate the road in as good condition as it was in when they commenced operations, should have finished the surface by the same means as had been adopted by the Vestry—by a steam or other heavy roller—and this they were required

by the Surveyor to do; and he also demanded that every hole should be covered, under the macadam, by a slab of concrete resting on the undisturbed ground all round the opening. Both demands were resisted by the Company, on the grounds that the means actually used by them for making good their openings, by filling and hand-ramming, were the best that they could employ; that they could not be compelled to use a steam roller for finishing the surface; that they were not liable to put in a concrete slab where nothing of the kind had previously existed; and that generally, as long as they maintained the road fit for traffic, in accordance with the provisions of the Gas-Works Clauses Act, 1847, they could not be called upon to conform to any fanciful requirements of the Surveyor. It was further alleged on the part of the Vestry that the filling in and making good of the openings had been carelessly done, even for the manner of procedure adopted by the Company; but this was disproved by the evidence, and it was even stated that the cross section of the road is now of truer shape where the Company had broken it up and re-made it than where it had not been touched. The Company urged that, so far from there being any necessity for the use of a steam roller, it was the action of that machine, as employed by the Vestry in the summer, which caused their main to leak, and necessitated their coming so shortly afterwards to break up the road and repair their pipes, at an estimated cost of over £2000. It was also pointed out that the action of the Vestry was premature, as by the Act the Company are liable to maintain, for a period of twelve months, any road they may break up, and there could be no question that in the present case they had in any way attempted to shirk their liability, the most that was alleged being the existence of a disinclination on their part to carry out the precise wishes of the Surveyor. Upon this point the decision of the Magistrate principally rested. He dismissed the summons with costs, on the ground that the Company had done all that is required by the Act, for the time already expired of the entire period during which they will be responsible for the state of the road in question. The Magistrate also held that the Company were only bound to conform to the reasonable requirements of the Highway Authority, which did not extend to any preference the latter might have for a particular method of road-making or repairing.

The Magistrate's decision is very valuable to all parties interested in such matters, and it decidedly possesses the merit of being a common-sense rendering of the provisions of the Act of Parliament. If it had been decided that a Road Surveyor can impose his conditions as to the manner in which a road is to be made good, as well as pass judgment on the work when it is done, the trouble and expense to which Gas and Water Companies in particular might in future be subjected would be enormous. Road Surveyors with a fondness for the biggest and heaviest steam rollers to be obtained, and with which they love to batter a roadway into shape in a few hours, may be expected to believe a Gas Company actuated by personal malevolence when they almost immediately proceed to dig holes and trenches in the newly-made street, for the purpose of seeing what effect the roller has had upon their own property. It would, in such cases, be an immense gratification to the Surveyor if he could compel the Company to roll the site of their openings in the manner favoured by himself, and override their objections to the instantaneous macadam-crusher. But if the precedent just made be followed, it will be borne in upon the minds of Highway Authorities that the best way to prevent that disturbance of the roads which is so annoying to them, of such danger and inconvenience to the public, and so costly to the unwilling agents thereof, is to avoid the use of any appliances for finishing a road surface which will damage underlying property; otherwise, the objects they desire to attain may be lost by the same means they may deem best calculated to secure them.

We are to-day enabled to make the gratifying announcement that from Christmas next the price of gas over the whole of the South Metropolitan Company's district will be reduced to 2s. 10d. per thousand cubic feet. This is equivalent to a reduction of rather over $\frac{1}{2}$ per cent. to the consumers, while by the action of the sliding scale the dividends of the Shareholders of the Company will, of course, be increased. Still it is from the point of view of the consumers that the promised reduction will be more generally regarded; especially in consideration of the fact that the gas supplied at the lower figure will be of greater purity by law, if not in fact, after the present winter. In reality the South Metropolitan Company's gas is as generally free from sulphur as that manufac-

tured under more stringent regulations; hence the imposition of a higher standard will have the effect merely of abolishing a certain latitude which has lately been seldom or never indulged in by the Company. It will, however, be as well to have it established by authority that the cheapest gas in London will be also classed with the purest. The impending reduction of the price of gas in any district of the Metropolis below the three-shilling low-water mark to which it has not even yet receded in every part of the capital, is a notable event, and one that will, perhaps, exert a very wide influence. The actual reduction is but twopence per thousand feet, it is true, but this twopence abolishes the long-established rule of the oscillation between the three-shilling and the four-shilling rates. For the first time for some years, a new figure will be introduced into the shillings column of the selling prices of London gas, and this will also bring the price of the South Metropolitan Company's gas within a measurable distance, in the popular estimation, of any cheap provincial gas supply. This contemplated step on the part of the Company is possibly to be regarded as less an act of grace than a necessity arising out of past legislation, consequent on favourable present circumstances, and as such it will probably be carefully noted in certain quarters. But this is not the best key to the situation. It may be said that the possibility of such a reduction being made is an argument for further pressure being applied to enforce continual efforts in the same direction, and it may be expected that something of this kind may be heard of during the ensuing year. Against this it can be urged that it would not be altogether advisable to attempt to turn a progressive Company's beneficial action towards the public, to their own discomfiture. Progress, although such a universal rule, is only an effect and not a cause; it may be fostered or hindered, and either process may be due in any particular case to very complex operations indeed. Where the former action is observed to obtain under certain conditions, those conditions should be allowed to continue in force, for fear lest hasty effort to improve their action may result in extinguishing it, or causing it to assume a different character. It is only to be expected that the South Metropolitan Company will soon need extended manufacturing facilities, at the present rate of increase in the consumption of their gas. They have taken the best, and indeed the only practicable course open to them, by giving notice of their intention to promote a Bill in the next session of Parliament for power to acquire some hundred acres of land below Greenwich, and it may be hoped that their proceedings in this respect will not be attended with undue trouble and expense. The recent amalgamations have not put them in command of much disposable land, and it is absolutely essential to the Company's undertaking, not only to have a fresh and ample site, but also that such site shall be capable of being turned to the best account for the supply of their large and rapidly-growing district.

An illustration of the difficulty sometimes experienced in working the machinery of local government is just now afforded by the town of Bolton. The same instance may also be brought forward to show that the safe and trustworthy management of gas undertakings and other public property by representative bodies depends upon the mutual good-will of the various sections into which the members of such bodies may be divided. A Gas Committee of a Corporation have to reckon with more factors than need be regarded by the Directors of a Company carrying on the same kind of business. They have not only their customers to consider, and also the ratepayers, who stand in a position regarding the undertaking somewhat analogous to that of the proprietors of a Company, but beyond and above all the Committee of a Town Council must observe the peculiarities of their fellow-councillors, if they do not wish to live in perpetual conflict with them. With all this there can never be any security for the Committee against harassing attacks and "obstruction" from their brethren of the Council, and it does not require much acuteness to see that serious results may easily follow a persistence in tactics of this nature, when directed against a trading concern. In Bolton, the consumption of gas has been steadily increasing of late years, and it appears to be pretty generally conceded that additional works are absolutely required, if the Corporation are to keep faith with the inhabitants of the district in which they have undertaken the responsibilities of gas supply. This necessity was recognized five years ago, but the demands of the public have so far been met by extensions of plant at the existing manufacturing stations. Now, however, the time has come when a fresh station must be established, and accordingly a site has been found, and purchased provisionally, pending legislative

sanction for the proposed extensions. Several Committees, besides the Gas Committee, finding themselves in need of further powers at the same time that the latter wish to go to Parliament, an Improvement Bill has been drafted for next session, and in this Bill the whole are included. The Town Council had decided to proceed with the Bill, but a violent minority bitterly opposed it, and at the town's meeting called for its consideration the minority of the Council were in the ascendancy, and the proposal was negatived; whereupon a poll was demanded by the supporters of the Bill, and this final appeal to the ratepayers was recently sanctioned by the Council. The opponents of the Bill maintain that the gas is the only pressing matter contained in it, and that the desired powers can therefore be obtained by Provisional Order, while the other matters can stand over indefinitely. The motive for advocating an Order is, of course, its supposed economy as compared with a Bill. Unfortunately for the friends of the former procedure, it is by no means clear that the Local Government Board have power to grant such an Order as is required, to enable the Sanitary Authority to make gas for supply beyond their own district. A case was submitted to Mr. Pope, Q.C., wherein this point was stated, as also an inquiry whether one Order could be made to include several objects. The opinion of Counsel on the first point is simply to the effect that the Local Government Board have not any such power; although he is careful to add that the Board sometimes do things beyond their powers, and if the confirming Act slips through unopposed, he *supposes* they stand. As to the second question, Counsel sees no legal obstacle to such a course; but, as a matter of practice, he states that separate Orders for distinct purposes are usually granted.

Returning to the first point—the desired Gas Order—we should imagine that there cannot be the slightest doubt respecting the soundness of Mr. Pope's view. Any Order the Local Government Board might grant would be worthless until confirmed, and if opposed at any stage, the entire expenditure of time and money involved would be absolutely lost, to be borne by the petitioners, who would then have to proceed by Bill after all. If economy be the motive of the minority of the Bolton Town Council, they are bent on a queer way of ensuring it. They should have known that the contemplated amendments of the special Corporation Act are not possible by any other means than a new Act, and that Provisional Orders were never intended to apply to cases such as that of the Bolton gas supply. For want of this knowledge the Council have involved their town in the cost of a poll, to be added to the other expenses of the inevitable Bill, and for all this they plead their devotion to economy! Bolton was one of the typical cases referred to in last week's "Circular," wherein general politics are said to influence municipal management to an abnormal extent. If this be so, these remarks may with advantage be read as an appendix to the article referred to.

We have had occasion to notice an action between Mr. Davis, of Westgate-on-Sea, and the Isle of Thanet Gaslight and Coke Company, respecting the definition of the Company's limits of supply, which was decided by the Master of the Rolls adversely to the Company. The case turned chiefly upon the meaning of the word "adjacent," occurring in the description of the Company's district in their special Act, and it was held that this did not include a spot three miles beyond one of the Company's named centres of operations. The subject was of importance to both parties in the action, as Mr. Davis had gas-works and mains of his own, with which he was supplying a newly-settled population, as well as an older body of consumers, the two together forming a snug connection, lying, as the Company believed, within their prescribed district. It appears that the Company had at one time been asked to supply with gas from their nearest station the nascent colony of Westgate, but they did not at once think fit to do so. Meanwhile, the then proprietor of the Granyille Hotel at Ramsgate, despairing of obtaining a supply of gas from the Company, purchased the existing works at Birchington, which the Company had permitted to exist, probably because of their insignificance, and proceeded to enlarge them for his own purpose. Westgate soon became populous and fashionable, and the Thanet Company thereupon began to awake to the sense of their folly in neglecting it; but meanwhile it had been otherwise provided for, and Mr. Davis, who had succeeded the earlier proprietor of the estate, defied the Company, with the result stated. Mr. Davis failed in an attempt to carve a parliamentary district for his own undertaking, and as the Company also failed to prove their right to the locality, it became a kind of no-man's-land. It should be stated that a proposal for the sale of Mr. Davis's works to the

Thanet Company was made without result. Now we see that the Company intend to apply in the ensuing session for power to define their district, so as to include the disputed ground. Mr. Davis will probably not object to this if the Company give him a fair price for his property, and undertake to supply his customers and his own establishment at a reasonable rate; but unless the Company are prepared to do this, it may be hoped, for the sake of right and justice, that they will not be permitted to ride roughshod over a man whose sole offence, so far as we can see, lies in having, by his own enterprise, occupied a position that was yielded by their supineness.

After passing through some vicissitudes, the proposal of the Aire and Calder Navigation Company to sell their gas-works to a hybrid Company composed of the Goole Local Board, the public, and themselves, for £33,000, has been accepted by the Board, subject to the consent of the Local Government Board and the ratepayers. There was some haggling about the terms of the purchase down to the day when the Board finally made up their minds to accept the terms of the Navigation Company, and they finally agreed to the proposal only after a promise had been exacted from the Company to make certain improvements in the works and mains, at a net cost of about £600. The matter has been repeatedly mentioned in our columns, because of the peculiar constitution of the proposed proprietary of the undertaking, which is also mixed up with schemes for water supply and sewerage, so that it is impossible to separate the conflicting impressions prevalent in the local mind regarding the three projects. The Board have, however, done a sensible thing at last in coming to a decision on their part of the preliminary negotiations. The price to be paid for the works is very near that stated by the valuer employed by the Board, and they have done well to hasten the reference of the whole business to the final authorities.

The Barnsley people are clamorous for a reduction in the price charged by the local Company for gas. The price is now 3s. 9d. per thousand cubic feet, and a deputation of the consumers has had an interview with the Directors of the Company to demand a reduction of one shilling, or at least ninepence per thousand cubic feet. The price certainly appears to be rather high, and it will perhaps be found advisable to lower it at the end of the current quarter, although, of course, it would be impossible to make such a sudden drop as the deputation required. It will, however, probably be found that in this as in other cases, more was asked than was expected, with the object of getting at least something. We quite agree with the contention of the deputation, that the Company's business would increase in consequence of a substantial reduction in their selling price, in support of which one or two gentlemen expressed their willingness to burn more gas when it is made cheaper. We trust that, if their wishes are acceded to, the enlarged consumption will not form the subject for future complaints that, when gas is cheaper, gas bills retain their old proportions. In all probability the Company will see their way to a reduction of threepence or fourpence per thousand feet, as an earnest of good intentions, with a promise of further concessions if warranted by a sufficient response from the public.

The enterprising Directors of the Sheppy Gas Company, who supply Sheerness and the neighbourhood, have issued a neat little four-page pamphlet for distribution among non-consumers, in which the general advantages of gas, and particular items of information respecting the Company's own business, are plainly described. The Company were very early in the field with offers to supply intending consumers with gas-fittings of all kinds on hire or deferred purchase, and the present publication is but another testimony of their desire to extend their connection and obtain the confidence of the inhabitants of their district. It is not stated that the Directors employ an experienced tract distributor to dispense their unpretending leaflet, or how they manage to circulate it. Its very smallness is in its favour, and should ensure its perusal by those who may be too incurious to consult a larger publication. Mr. A. W. Marks, the Secretary of the Company, expresses his willingness to forward a copy to any one sufficiently interested to send a stamped envelope for the same; probably with the desire of seeing his procedure copied elsewhere.

At the last meeting of the West of Scotland Association of Gas Managers, Mr. D. Bruce Peebles described in detail his ingenious arrangement for registering the consumption of gas in street-lamps, by means of a clock connected to the

lamp-cock in such a way that the clock is set in motion by the movement of turning on the gas, and stopped when the cock is shut. The burner being fitted with one of Peebles's governors, which regulate the consumption of gas to any desired rate per hour, the number of hours during which the clock has been working in a given period multiplied into the rate of burning gives the consumption, without reference to a meter. The advantages of such an arrangement are very obvious, the space required for the clock being much less than for a meter, and it is capable of being more readily examined. Mr. Peebles may perhaps experience some difficulty in inducing public authorities to rely upon his apparatus, but there is no valid reason why it should not be successful. Another useful application of Mr. Peebles's clock system of measurement might certainly be found, as claimed by him, in the convenient registration of gas consumed for special purposes, or for temporary occasions, when the use of a meter would not be possible.

The Southern District Association of Gas Engineers and Managers held a quarterly meeting in London on Thursday last, under the presidency of Mr. James Hunter, when there was a fair attendance of members to hear Mr. Goddard, of Ipswich, descendant on the manufacture of sulphate of ammonia. Mr. Goddard's paper was eminently practical, as befitted the subject, and a great deal of very interesting matter was brought forward in the course of the subsequent discussion. The usual question of the comparative benefits of selling ammoniacal liquor off the premises or working it up on the spot was, of course, mooted. The answer to any querist on this matter must be with strict reference to the particular circumstances of the case. There is plenty of information to be obtained as to the yield of sulphate from coal, and the cost of its manufacture. With these factors to work with, and the conditions of sale being ascertained, there can be no difficulty in determining whether it will pay better to sell liquor or manufacture it into salts on the spot.

Water and Sanitary Notes.

As might be expected, the Metropolitan Board are beginning to show a feeling of annoyance at the activity and pretensions of the Delegates who profess to represent the Vestries and District Boards of the Metropolis at the meetings over which Mr. E. J. Watherston presides in the Vestry Hall of St. Martin's-in-the-Fields. These Delegates have presumed to communicate with the Home Secretary in the name of their Vestries, and have also sent out a circular to sundry provincial authorities, requesting particulars as to the local water supply. It is argued that the Delegates only represent about one-third of the total number of Vestries, and doubt is raised whether the Vestries really know or approve what the Delegates are doing. Beyond all dispute, Mr. Watherston's conclave is a very irregular and informal assembly, though it possesses in that gentleman an able Chairman, and in Mr. James Beal a veteran Secretary. There is one consolation, that the Delegates are not likely to spend £16,000 on the water question, to be subsequently charged on the ratepayers by means of a Bill of Indemnity.

"One Puzzled" writes to the *Globe* to know what is to be understood by the phrase "unfit for dietetic purposes," as applied by Dr. Frankland to a large portion of the Metropolitan Water Supply. In plain English, the term would seem to signify that the water in question was "not fit to drink." Yet those who drink it constitute a very large portion of the inhabitants of London, and the health of the Metropolis continues to be remarkably good. It is an anomaly which no one but Dr. Frankland can explain, that millions of people are able to drink water "unfit for dietetic purposes" day after day without being any the worse for it. The authority with which Dr. Frankland speaks on this subject is almost amusing when we compare his conclusions with the small substratum of fact on which he has to build. Dr. Frankland professes to be in a position to report on the state of the Metropolitan Water Supply "during" the month of October. But on looking at his table of analyses we find that all his samples of water connected with the supply from the Thames and the Lea were taken on Oct. 19. The sample relative to the Kent Company was obtained on the 18th. Thus all that Dr. Frankland can properly speak of is limited by samples taken on a single day in the course of a month. Five samples out of the seven from the Thames and the Lea are derived from cab-ranks. Results thus obtained are exalted to an importance which seems altogether disproportionate to their true significance. But these analyses, as

expounded by Dr. Frankland in the reports of the Registrar-General, have served to frighten London, though it is to be hoped that the public are beginning to inquire into the meaning, as well as the sound, of the portentous phrases which fall upon the popular ear.

The Sheffield Water-Works Company have gained a decision in their favour from the Master of the Rolls, establishing their right to charge an additional sum over and above their ordinary rates in respect of the use of a bath in a private house. The suit was a test case, the defendant, a Mr. Bingham, being supported by ample funds raised by the "Sheffield Water Consumers Defence Association." Some ingenious arguments were adduced in opposition to the claim of the Water Company, the main contention on the side of the defendant being that the water required for the bath was part of the supply which the Company were bound to furnish for ordinary domestic purposes. It was argued that the Company were sufficiently remunerated for the water expended on the bath by the addition which such an apportionment gave to the annual rateable value of the house. There is a clause in the Company's Act which gives them power to charge for water supplied to "baths, ponds or pools, or closets," and for other purposes. The Counsel for the defendant argued that this had reference to "public baths," though it was a little difficult for him to show that the closets could be public. It is rather amusing to find that the Master of the Rolls looked upon the term "pool" as signifying "cesspool," to which a supply of water would be an inconvenience instead of a benefit. The expression "ponds or pools" clearly has reference to ornamental water in gardens. But with regard to the "bath," there was practically no room for doubt, though the ingenuity of Counsel could readily pile up arguments on the subject, mainly founded on a confusion of ideas as between washing and bathing. A "bath," the Master of the Rolls observed, was a "moveable fixture." As it exists in most houses, a bath is no more "moveable" than a cistern—a fact which helps still further to show the reasonableness of the decision arrived at. A regular bath in daily use will consume, as the Judge observed, sixty gallons a day on a moderate computation. If it were only used for 300 days in the year, there would be a direct consumption of 18,000 gallons, independently of waste. To suppose that this is to be given in as part of the ordinary domestic consumption is obviously unreasonable. The supply must be paid for in some shape or other, and the method adopted by the Sheffield Company is both reasonable and legal. The question is now settled, and the decision will confirm the rights of Water Companies in general. To complain, after the manner of one of the Sheffield journals, that an extra charge for a fixed bath is a "tax on cleanliness," is to assert a right to take possession of a commodity without paying for it, on the plea that it is to be used for a good purpose.

The prospect of a greatly increased demand for water which impelled the Manchester Corporation to obtain an Act for drawing a supply from Thirlmere, has failed thus far to be verified. From a lengthened and interesting statement in the *Manchester Examiner*, it appears that instead of the demand for water in that city going on at a rapidly increasing rate every year, it is now only a few thousand gallons more per day than it was in 1875. In 1874 and 1875, Mr. J. F. Bateman alarmed the Corporation by statements, based on authentic figures, showing that the demand for water, if sustained in its progress, would soon outstrip the supply. Thus it was stated: "The demand for water, both in and out of the city, is going on at a rate three times as fast as the 'increase in the population.'" Hence the felt necessity for further provision to meet the expected demand. It is said to be due to the energy and foresight of Alderman Grave, and his intimate knowledge of the Thirlmere district, that the Water-Works Committee of the Corporation were induced to take up the enterprise which now awaits execution. At present the Committee have on their books about 200,000 open accounts for domestic and trading purposes. The population represented is very nearly a million, residing on an area of ninety square miles, the revenue for the present year is about £216,000, and there is in every house a constant supply direct from the mains, but the consumption is only twenty gallons per head per day, a strict supervision being exercised to prevent waste. The Water-Works Committee are delarred from making profits to distribute in the relief of rates, and hence they are the more disposed to improve and enlarge the supply. The present consumption is 18 million gallons per day for domestic and trading purposes, with 16 million gallons per day for six days per week for compensation. Mr. Bateman's estimate for the completion of the Thirlmere scheme was £3,500,000, comprehending a

supply of 50 million gallons per day over the present quantity. But it must be remembered that in drawing water from Thirlmere, Manchester has undertaken the responsibility of supplying reasonable demands for water on the way. As for the prospects of the undertaking, our Manchester contemporary signifies that it may be "many years" before the scheme is carried out, and much will depend on a revival of manufacturing prosperity.

The Lower Thames Valley Main Sewerage Board are defeated on their scheme for disposing of the local sewage by means of an irrigation farm at Molesey. The Local Government Board express their regret that in the discharge of their public duty they find themselves unable to grant the Provisional Order applied for. They recommend the Sewerage Board to consider the scheme of Sir Joseph Bazalgette for carrying the sewage into the West Kent system, so as to obtain an outfall in Long Reach, seven miles below the outfall of the Metropolitan Board. The Sewerage Board have resolved to "consider" the matter accordingly, taking another year for the purpose. The penalties for allowing the sewage to flow into the Thames in the district of the Sewerage Board are suspended until Michaelmas 1883, with the certainty that a further suspension will then be sought. The Local Government Board, in communicating their decision to the Sewerage Board, forwarded a copy of the report drawn up by their Inspector, Mr. J. T. Harrison. With respect to the objections urged by the Lambeth Water Company against the scheme, the Local Government Board say that "it is at least doubtful" whether the irrigation of the proposed farm with sewage would not affect the supply drawn from the subsoil by the Company. It is added that "the Board would incur very grave responsibility if they sanctioned a scheme which might prejudicially affect the water supply of any part of the Metropolis."

A very powerful appeal to the Corporation of Norwich, with respect to the sanitary condition of that city, has been published in two recent issues of the *Norfolk News*. The disclosures are very properly described as both distressing and scandalous. Certain poor parts of the city have been visited by a member of the press, accompanied by a medical gentleman. Bad as some parts of London may be, the description given of the dwellings of the labouring class in Norwich is worse than anything with which we are acquainted in the Metropolis. The wretched state of repair in which many of the houses were found, is one remarkable feature. It seems as if some of these dwellings must very soon tumble down. Another extraordinary fact is the indifference displayed by the Sanitary Inspector, who either has too much to do, or has deliberately resolved to do nothing, perhaps believing this to be the best policy if he wishes to give satisfaction to his employers. There is a contract for the removal of house refuse, yet dust-bins are found in the most revolting and overloaded condition, and the people in many instances are compelled to throw their refuse on the street pavement. In one neighbourhood there are numerous wells, and into these the surface drainage often finds access, the water being fouled to a degree which must render it dangerously unwholesome. Yet there is an ample supply of excellent water close at hand in the Water Company's mains. The essential conditions of decency are cruelly violated, and the poor people complain that they cannot get any help or protection from the Authorities. It is evident that some of the houses in the city ought at once to be demolished, while others require structural alteration, and there is a general need of radical improvement. One way of effecting this healthful reform would be by applying the provisions of Mr. Torrens's Act. Among other arrangements requisite for the welfare of the people, the dust-bins should be regularly emptied at short intervals, the wells should be closed, and the water henceforth laid on from the mains. Some of the facts are said to be so grossly bad that they will not bear even to be hinted at, and we can only say that if the circumstances are at all as represented, the "sanitary arrangements" deserve the designation given to them of being "infamous." The presence of scarlet fever is no marvel under such conditions, as also a high death-rate. The people, we observe, appear to be better than their surroundings; but this will not long be the case, if they are left in such a state of physical degradation as our local contemporary describes. We cannot suppose that such a violation of sanitary laws will be allowed to continue, now that the facts are exposed by the public Press.

FATER'S DESTROYER AT LEEDS.—In reference to the paragraph in "Water and Sanitary Notes" of the 2nd inst., we are asked to state that the royalty paid to the patentee for the use of his apparatus at Leeds was £2150, not £150.

ECONOMICAL CARBONIZATION.

MR. G. LIVESYER's recent communication on the question he therein propounded: "Is a high yield of gas per ton an infallible test of good management?" could receive, in the form in which it was put, but one answer. Good or economical management is not by any means assured to the Company who possess a good retort setter, aided by an equally good foreman stoker. When the Chairman of an important Company explained the absence of the Engineer from a Shareholders meeting by saying "he was in his right place, in the 'retort-house,'" he displayed an imperfect acquaintance with the duties of that officer, and probably proved nothing more completely than that the addition of a fairly good director to the stoker and retort setter would yet leave much to be desired and to be provided before success would attend the operations of a Gas Company. A high yield of gas per ton may be obtained, as our correspondents generally have pointed out, at an excessive and disproportionate cost. The large quantity of gas may be of inferior quality for lighting purposes, and dangerously impure. The plant erected for its production may have been built and may be maintained at exorbitant cost; or the gas when made may be badly distributed, and the margin obtained beyond the ordinary standard thus wasted. The ways are many in which a man of "one idea" may bring trouble and loss in this particular direction, as in any other. This one item, then, as an "infallible" test, must be summarily dismissed, as would have to be any other standing similarly alone. At the same time a good manager will not be in any danger of slighting the importance of his retort-house work. Such a man, while he gives due and thoughtful attention to each of the other and numerous departments of his business, will be in no danger of overlooking this, and will, we think, surely find it a field yielding the most ample returns for the care he bestows upon its cultivation. Our correspondents have all confined themselves pretty closely to the limits set out by Mr. Livesey; that is to say, they have dealt only with a range, the lower extremity of which is above the reach of serious reproach. How much that limit might be depressed, and yet not go below the experience of many small and ill-designed works, many of our readers know well. In such cases as these the question is unencumbered with difficulties, and a greater yield is an indispensable condition of permanent success.

One fact is clearly, we may say luridly brought out by the present discussion, as it has been many times and in many ways before—i.e., that gas engineers generally are richer in the possession of theories and beliefs than of facts and demonstrations. That the theories are often—indeed, usually well founded, there can be no doubt; but it is matter for real regret that on subjects capable of demonstration we are not better able to give a "reason for the faith that is in us." May we again direct the attention of the Committee of the British Association of Gas Managers to this matter, and repeat our suggestion that they have machinery easily at their disposal for obtaining and furnishing to their fellow-members much of that exact knowledge on this subject which is conspicuously needed. The difficulty of obtaining such information from the researches of individual experimenters is, we think, illustrated by the position taken by our esteemed contributor who opened this question of economical carbonizing, starting with a doubt as to the wisdom of a common practice. Mr. Livesey desires to see it definitely cleared away. He says: "It is 'very desirable that some attempt should be made to 'ascertain the economical maximum make of gas per ton,' and to this end the following *pros* and *cons* may be suggested, and lead to the necessary experiments that should 'be undertaken to clear up the doubtful points' and he concludes his article by promising that such experiments shall be put in hand, and the results, with his usual liberality, published, for comparison with those of other investigators, or for the benefit of those unable to conduct such inquiries for themselves. The correspondence has, however, confirmed the opinion originally held by Mr. Livesey, and his "last word" on the question is, "Are any experiments really 'required after this?'" Now, when a busy man has satisfied himself on a matter, it is not unnatural that he should decline the labour of prolonged experiments needed simply to satisfy other people. The inquiry is, therefore, not an unnatural one, though we are happy in this case in our belief that it is only an inquiry, and not the statement of a conclusion. The inquiry is, for our purpose, sufficiently answered by the inquirer himself when he states: "It appears . . . that the supposed advantage of a high make of gas per ton 'of coal carbonized is not based on any actual experiments;

"no one seems to know how much the illuminating power "is reduced by an increase of five per cent. in the volume of "gas made; or the difference in the tar, either as to quantity "or quality; or what extra amount of fuel is required; or "whether higher heats produce a gas containing more car-bonic oxide and the troublesome sulphur compounds." If these questions and others of equal importance are capable—and the fact will hardly be disputed—of settlement once and for all by a series of careful experiments, those experiments ought to be made, however strong may be the convictions of the inquirers as to the results likely to be obtained. If the lines of such an inquiry were laid down by the Committee of the British Association of Gas Managers, we feel satisfied that no difficulty would be found in meeting with willing and competent men who would follow those lines, and so furnish the materials from which the definite conclusions desired could be obtained.

The figures used in this controversy are applicable especially to the product of but one coal-field—that from which London is, in the main, supplied. There are used in some places coals from which 9800 feet of gas would be an impossible maximum, while in parts of the Yorkshire field, for instance, 10,500 feet would be but an ordinary make. In the various coals sent to London from the Durham district there is a very considerable divergence in all the products, and it is therefore of first importance to the value of experiments such as are proposed that they should be made with the same sample of coal. All the deductions unfavourable to high makes per ton have been based upon the assumed necessity for using canal to compensate for the diminished illuminating value of the gas produced. The necessity for this use of an increased quantity of canal is, we think, by no means determined. Mr. Stevenson has found no such necessity, neither have the London Companies, with their largely increased make per ton, increased their percentage of canal in anything like the direct ratio which some of our correspondents have calculated out. This is the very essence of the question, involving, as it does, the method of carbonizing throughout. Are we obtaining the economical maximum of light from the coal used? It is possible so to carbonize a coal capable, under proper treatment, of yielding 10,000 feet of sixteen-candle gas per ton, that only 8000 feet, and that of inferior quality, shall be obtained from it; and, of course, any degree between the two is equally possible. This all-important element, therefore, of the necessary cost of canal remains to be determined by experiment.

The error of estimating the increased yield of gas at its selling price to the consumer has been pointed out frequently, but it has yet been twice introduced in the course of this correspondence. As in the case of diminished leakage, so with increased make, nothing is added to the rental, and consequently all the advantage is in the reduced consumption of coal, which must be estimated at its net cost. Saving on leakage has the advantage over increased yield, that the former may be estimated at its cost in the holder, while the latter must be taken in the retort-house only. The argument in favour of short and light, as against comparatively longer and heavier charges, is clearly an appropriate one, and would have something to do with the question of an increase or not in the percentage of canal used.

We feel satisfied that the problem which has thus been re-stated will not be allowed to rest again without further practical efforts to solve it. In the meantime, it is clearly a mistake in these days to buy a coal for one of its constituents only, or in all places to put the first value on the same constituent. Improved makes should be aimed at rather by means of amendments in settings and apparatus than by heavier firing—working, in fact, still further in the same direction which in the last few years has led to such good results.

MR. R. SMITH, of Peterhead, has been appointed Gas Manager to the Heywood Local Board.

It is stated that, at to-day's meeting of the Commissioners of Sewers of the City of London—who have the lighting of the streets under their control—the Streets Committee will present a report on the reference to them of the tenders received for lighting certain parts of the City with electricity. The following recommendation will be submitted for adoption, viz., to divide the area to be lighted into three districts, to be assigned: No. 1 to the Anglo-American Electric Light Company (Brush system), at a cost of £1410 for 12 months; No. 2 to the Electric and Magnetic Company (Jablochoff system), at a cost of £2390 for 12 months; No. 3 to Messrs. Siemens Brothers, at a cost of £3720 for 12 months.

PURCHASE OF THE BRIDGNORTH GAS-WORKS BY THE TOWN COUNCIL.—At the meeting of the Bridgnorth Town Council on Thursday last—the Mayor in the chair—the Gas Committee reported that they had negotiated with the Directors of the Bridgnorth Gas Company, and offered to purchase the undertaking of the Company for £14,000, which had been accepted. The Committee recommended that £16,000 be borrowed for a term of 50 years, subject to the sanction of the Local Government Board. The report was agreed to.

GAS LEGISLATION FOR 1880.

(Continued from p. 726.)

LAST week we noticed six out of the eleven Acts of Parliament passed last sessions giving extended powers to provincial Gas Companies. The following refers to the remaining five:—

The *Maidstone Gas Act* is to empower the Maidstone Gas Company to construct additional works, to raise further capital, and for other purposes. The Company were first incorporated by an Act which was repealed by another Act of 1858, under which the Company have since carried on business. The capital authorized by the Act of 1858 consists of £12,500 in "A" shares, bearing ten per cent. dividend; £12,500 "B" shares, entitled to four per cent.; and new shares to the amount of £25,000, bearing seven and a half per cent. dividend; in all, £50,000 of ordinary share capital. The Company have also borrowed £10,000 on mortgage. The Act provides that as from June 30, 1880, the whole of the aforesaid capital is to be converted into Maidstone gas consolidated stock consisting of £51,785, bearing a seven per cent. dividend. Additional capital may be raised, under the auction clauses, to the amount of £50,000—not more than £40,000 to be issued the following year, or £10,000 in any subsequent year after the passing of the Act—to bear seven per cent. dividend. Power to borrow £12,500 is also given in respect of the new capital. The sliding scale is imposed with an initial price of 3s. 8d. per thousand feet. A one per cent. insurance-fund is permitted to be formed out of excess profits, and there is also included the usual sanction of a reserve-fund when the sliding scale operates to increase dividends. The Company take power to acquire certain lands for the purpose of their undertaking, and to supply or let on hire gas stoves, &c., and they may also supply gas in bulk. Shareholders are to have one vote for every £10 of stock or shares held. The gas is to be supplied at the usual pressure, and to be of fifteen-candle power; it is to be wholly free from sulphuretted hydrogen, and after the 1st of February next is not to contain, on an average of three days, more than twenty grains of sulphur in one hundred feet. A penalty of £5 attaches to any proved defect of purity or illuminating power. The Company may be represented by an officer on any occasion of the testing of the gas, but it is not necessary that notice of the time of any intended testing should be given them. The Corporation are to provide a testing-place at or near the Market Place, or in some other part of the borough of Maidstone to be agreed upon between themselves and the Company, or, in default of such agreement, to be fixed by the Board of Trade. The Company may, however, at their own expense, have a separate testing-place of their own in the same building. Meters used for measuring the supply of gas to public lamps shall be tested in the manner prescribed by the Sales of Gas Act, if their accuracy is disputed by the Company or any public authority, and if proved to register erroneously, are not to be used in computing gas supplied on the average meter system.

The *Prescot Gas Act* enlarges the powers of the Prescot Gas Company as regards capital and lands, and in other ways amends the Company's Act of 1867. By the old Act the Company were incorporated with a share capital of £9000, whereof £5000 were "A" shares, and £4000 were "B" shares, all paid up, and the Company were authorized to raise £2000 on loan. The Company are now empowered to issue additional "C" shares or stock to the value of £16,000, by auction or tender, dividend on which is limited to seven per cent. on ordinary, or six per cent. on preference capital. All classes of stock or shares will suffer alike in any insufficiency of profits. The Company may also borrow on mortgage in respect of the new capital not more than £4000. Section 35 of the Gas-Works Clauses Act, 1871, is abrogated in favour of the Company so far as to defer to March 25, 1882, the necessity of furnishing accounts to the Local Authority. Fifteen-candle gas is to be supplied, at a price fixed from time to time as follows:—If the total gas consumption of the preceding year shall have been under 9 million cubic feet, the maximum price is to be 5s. 10d. per thousand feet; if the consumption shall have been over 9 million, and under 11 million cubic feet, the maximum price is to be 5s. 7d. per thousand feet; and if the consumption shall have exceeded 11 million cubic feet, the maximum price is to be 5s. 4d. per thousand feet. Provided always that the Company shall allow a discount of ten per cent. on all quarterly payments made on demand or at the office of the Company within one month. The Company are to furnish the Local Board with a yearly statement, subject to audit, of the consumption of gas, except the same shall be admitted by the Company to exceed 11 million cubic feet. The Company take power to manu-

facture and store gas, and conduct the general business of their undertaking on lands described in the schedule to the Act. The usual clauses as to testing, pressure, interest on deposits, and other formal provisions, are included.

The *Reading Gas Act* enables the Reading Gas Company chiefly to raise additional capital and to construct new works. In 1862 the Reading Union Gas Company and the Reading Gaslight Company were amalgamated and incorporated into one Company, under the present name, with a capital of £40,000, and power to borrow £10,000. And again in 1870 an Act was passed to extend the Company's limits of supply, and enabling the Company to construct new works, and also to raise a further capital of £40,000, and to borrow £10,000 in respect thereof. With the exception of £14,000 in shares and £8000 to be borrowed, the Company have run through the powers thus conferred, and require to extend their works. The present Act empowers the Company to raise £80,000 by auction or tender, not more than £30,000 to be raised in the year following the passing of the Act, or more than £15,000 in any subsequent year. Dividend on the new capital is limited to seven per cent. ordinary, or six per cent. preference; all classes of shares or stock to bear proportionately any deficiency of dividend, and no back dividends on the new capital are to be paid beyond two years. Holders of the new shares or stock are entitled to all the rights and privileges appertaining to the Proprietors of any other classes of the Company's shares or stock. The Company have power to borrow £20,000 in respect of the new capital, and also to form a reserve-fund of £12,000. The Company are to supply fourteen-candle gas at the usual pressure, to be tested at the Corporation Buildings, at maximum prices varying within the borough from 4s. 3d. per thousand feet to consumers of less than 20,000 cubic feet half yearly, to 4s. per thousand to consumers of over 20,000 and under 40,000 cubic feet half yearly, and 3s. 9d. to consumers who take 40,000 cubic feet and upwards. Public lamps in the borough are to be charged after the rate of 3s. 5d. per thousand cubic feet. Consumers residing within a zone of one mile without the borough are subject to an increase of 1s. per thousand cubic feet on these proportional rates, and when residing beyond this zone to a further addition of 3d. per thousand cubic feet. Provided always that reductions in price within the borough are to be followed by corresponding reductions outside. Saving clauses are inserted in the Act for the protection of the Thames Conservators and the Urban Sanitary Authority. The Company take powers to acquire compulsorily certain lands within three years, and to erect additional works; and also obtain sanction for an agreement between the Company, Messrs. Huntley and Palmers, and the Corporation, respecting a certain right of way which the Company propose to extinguish, and to make a new road in place thereof.

The *Wandsworth and Putney Gas Act* authorizes the Wandsworth and Putney Gaslight and Coke Company to raise additional capital, and grants the Company other powers. By an Act of 1856 the Company were incorporated for the supply of gas to the parish of Wandsworth, and certain parts of the parishes of Battersea and Putney, with a capital of £30,000, half bearing ten per cent., and the other half seven and a half per cent. dividend; and by an Act of 1866 the Company obtained power to raise £40,000 additional capital at seven per cent., all which share capital has been raised and expended, and the Company moreover owe £16,000 on mortgage. The present Act authorizes the Company to raise by auction or tender £120,000, in addition to their old capital, at seven per cent. dividend. The new capital is to be issued by instalments of not exceeding £40,000 for the first year, and £15,000 in any subsequent year after the passing of the Act. The holders of new stock or shares are to have all the rights and the privileges of the existing Proprietors. Notice of any intended sale of shares is to be given to the Clerk of the Metropolitan Board of Works as well as to the London Stock Exchange. The Company take power to borrow £30,000 in respect of the additional capital. The sliding scale is imposed, with the initial price of 4s. per thousand cubic feet. The usual provisions as to the formation of an insurance-fund and reserve-fund are inserted in the Act. The Company obtain power to take certain lands by agreement for the purposes of their undertaking, and also to erect on their own land dwelling-houses and cottages for their officers and servants. The illuminating power of the Company's gas and the manner of testing it remain as prescribed by their former Acts.

The *Yeadon and Guiseley Gas Act* confers further powers, chiefly with respect to capital, on the Yeadon and Guiseley Gaslight and Coke Company. The Company were re-incor-

porated by an Act of 1868, with a capital of £29,325 and £7300 borrowed, for the supply of gas to a certain district in the parishes of Guiseley and Otley, in the West Riding of Yorkshire. This new Act empowers them to raise £30,000 additional capital at seven per cent., under the auction clauses, at the rate of £10,000 for the first year, and £5000 in any subsequent year after the passing of the Act. All classes of shares and stock to bear proportionately any deficiency in dividend. Power is also given to the Company to borrow £7500 in respect of the new capital. An insurance-fund is to be formed with the usual proportion of any excess profits over the requirements for the maximum dividend, and any surplus remaining is to be carried to the credit of profit and loss. There is no special stipulation as to the price to be charged for gas. The Company take power to convert residuals, &c., on their existing lands, and also to make and let on hire or sell gas-fittings and stoves, and to hold licences under patents. The qualification of Directors elected after the passing of the Act is fixed at £100. The usual stipulation as to pressure is included in the Act.

(To be continued.)

THE SOUTH METROPOLITAN GAS-WORKS.

(Continued from p. 644.)

THE TANK AS FINISHED.

In the original design for this tank the wall was shown to be 5 ft. 6 in. thick at the bottom, gradually tapering to 3 feet thick at the top, thus necessitating the filling in of the space between the back of the wall and the face of the excavation, from the bottom to the top, with the flue sand. As it is impossible to make this backing as solid as the original undisturbed soil, it is advisable to have as little of it as possible, particularly in the case of a rendered tank, where the full pressure of the water is exerted upon the wall itself. The excavation of a tank is of necessity wider at the top, owing to the system of timbering with 9-inch deals, each successive frame of the deals or runners being placed within that next above it, the face of the second tier being 8 inches in front of the first, and so on. The excavation of the ring, therefore, consists of a series of steps, 8 inches wide, at intervals of 12 or 14 feet, according to the length of the runners, and as the wall is reduced in thickness as it rises, whilst the trench becomes wider, the amount of backing increases as the work approaches the ground line.

The soil for about 20 feet above the chalk consists of fine sand, which will stand vertical if the water is all drained out of it, but becomes running sand if the excavation is attempted whilst it remains saturated with water, which is its normal condition. Fortunately the contractors provided ample pumping power to thoroughly drain the ground in advance of their excavation; and, as a consequence, the sand stood firm at the back of the runners. Resting upon this fine sand is a thick bed of sharp sand and gravel, which was used for the concrete. This would not stand at all without support from the runners. Then came some loamy stuff; and on that the surface market-garden mould. Seeing that the lowermost bed of sand offered such a solid support to the concrete, it was thought advisable to dispense altogether with the artificial backing where the sand existed, and to fill in the concrete solidly against it. Hence the projections at the back of the wall, which, if unexplained, would appear so strange, there being two inverted sets of, each 8 inches in depth, as shown in the drawing of the finished tank accompanying the present week's JOURNAL. The wall thus thickens in an upward direction to the top of the fine greensand, instead of diminishing in thickness as at first intended.

The original thickness at the bottom was to be 5 ft. 6 in., and the diameter of the tank 216 feet, for a 212-foot gasholder. But it was found that, with the sand so firm, and by building close up to it, it would be safe to reduce the thickness at the bottom to 4 ft. 6 in., thus increasing the diameter of the tank to 218 feet, and the gasholder to 214 feet. The depth has also been increased 6 inches, thus making the total depth 55 ft. 6 in., of which the rest-blocks, 72 in number, made entirely of concrete, take up 18 inches, giving a total working depth of 54 feet.

The sharp sand and gravel will not stand at a less angle than 1 to 1, which, in the original drawing, is the angle shown for the whole of the cone; but finding the greensand so firm, it was thought possible to reduce the amount of excavation, and the angle was accordingly altered to 6 inches to 1 foot for the lower part of the cone, thus effecting a double saving—viz., the cost of excavation and the trouble of disposing of the excavated material. The benching half way up the cone was consequently increased from a width of 4 feet to that shown in the second plan. The gravel and sand above this line was valuable, and as much of it as possible was taken out.

Fortunately the relations of the Company with the contractors were such that these considerable alterations could be made without any fear upon either side of a possible disagreement. Everything throughout the work has gone on smoothly and satisfactorily, and although, owing to the excessive rain last year, the amount of water in the ground was greater than was expected, the pumps were at all times fully masters of it. There were duplicate sets of pumps, three in a set, one set being 15 inches, and the other 18 inches in diameter; one set was kept in readiness to work if the other broke down in pumping for weeks together 1500 gallons a minute. The description of the timber framing for the crown of the gasholder will be given when the drawings representing it are published.

Notes.

[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

THE DETERMINATION OF NITROGEN IN COAL GAS.

Mr. G. S. T. Kennedy sends to the *American Gaslight Journal* an account of a very simple method devised by Dr. A. W. Wilkinson. Chemist to the New York Mutual Gaslight Company, for the estimation of the nitrogen in coal gas. The apparatus required consists essentially of a glass eudiometer tube of only one limb, divided into 100ths, open at the bottom, and having a stop-cock at the top, to which a funnel is also accurately fitted with a ground joint. The tube is held in a stand over a well cistern about 6 inches in diameter and 2 feet deep, filled with water. When ready for use, the tube is filled with water and the stop-cock closed. The funnel being removed, a connection is then made by a flexible tube from the top of the glass tube to the gas to be tested for nitrogen, and by opening the stop-cock 10 measures of the gas are drawn into the eudiometer. Oxygen of known purity is then introduced to the amount of 10 to 15 measures, and the tube is then carefully lowered into the well, a little water being run in by the funnel, with the object of causing a thorough mixture of the gases, and when this has been attained, and the tube finally submerged to the level of the gas contained, an electric spark is passed through it by the wires with which it is provided. After the explosion thus caused, which, although active, is not sufficiently violent to overcome the water-seal, the carbon and hydrogen compounds are found to have given place to carbonic acid and water, leaving an excess of oxygen and nitrogen unaltered. The carbonic acid is dissolved out by a solution of caustic potash, introduced by the funnel and allowed to run down the tube. This is followed by a solution of pyrogallate of potash, to absorb the oxygen, leaving the nitrogen. The observed volume of nitrogen multiplied by 10 gives the percentage in 100 measures of the coal gas examined. Care must be observed in the manipulation to avoid any admission of air to the tube, and it is also necessary to have ascertained the amount of nitrogen present in the oxygen used. When the oxygen is taken from a cylinder under pressure, as sold by manufacturing chemists, one determination of its percentage of nitrogen is sufficient for a series of analyses. The process described is simple, and requires but a few minutes for its completion.

WATERPROOFING MASONRY ARCHES.

Experiments have been made with various waterproof materials in common use as roof coverings, for the discovery of the best means of protecting from damp the land arches of the East River Bridge, at New York, which are to be used as stores and for general mercantile purposes. The severe climate of the locality, alternating between the extremities of heat and cold, and the strains to which a continuous coating is exposed when a constant and heavy traffic passes over it, rendered the selection of a suitable material unusually difficult, and in consequence several crucial tests were devised, to which were submitted the different materials offered in reply to a general invitation to tender for the work of waterproofing. A description of the tests and the materials experimented upon, with a statement of the results obtained, has been submitted by Mr. F. Collingwood to the American Society of Engineers. The method of testing is sufficiently ingenious in its bearing on the conditions to which waterproof roofings and road coverings are subject in ordinary use.

Wooden moulds were prepared with grooves about 2 feet long, with enlargements at each end, similar to the form of cement briquettes, or metal plates as usually prepared for tests of tensile strength, and the grooves were filled with the material under examination. These, with some flat pieces of the material, were exposed to a freezing mixture for 48 hours. If the specimens endured the cold test without sign of fracture, the plates were first tested with a loaded point, for susceptibility to penetration, and were then dropped through a short distance to see if they would break. In this way an idea was obtained of the relative hardness and brittleness, as well as of the contraction under cold, by careful measurement, of the specimens. After this they were heated, and their behaviour at a high temperature was noted. Next, two forms of durability tests were imposed, resting on the assumption that in time destruction would be caused either by the gradual evaporation of the volatile constituents of the mixture which originally gave it plasticity, and thus causing it to become crumbly and absorbent (this was tried by very carefully weighing a sample before and after its exposure in a sand bath to a temperature of 212° Fahr. for 48 hours, and noting the percentage of loss); or disintegration might be due to the absorption of water, and its consequent freezing and thawing. To determine this question, carefully-weighed samples were soaked in water for 48 hours, then wiped, and the increase of weight observed. The materials tested comprised coal tar and felt; coal tar mixed with Trinidad bitumen and sand; asphaltic mastics composed of Val de Travers and Limmmer asphalt; Trinidad bitumen, residuum oil, limestone, &c.; Trinidad bitumen mixed with 10 per cent. of residuum oil; and other compounds of the same substances, together with a mixture of soapstone, crude petroleum, and resin. The samples containing coal tar were all rejected, apparently because of their failure to stand the dry-heat test for evaporation, and eventually preference was given to the mixture of refined Trinidad bitumen and 10 per cent. of residuum oil, and Mr. Collingwood stated his belief that the

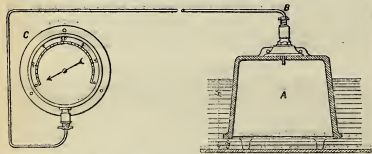
bitumen would really be best without any admixture of oil, for many purposes. It does not appear that coal tar pitch, specially prepared, entered into the competition, or a somewhat different choice might have been made.

A CHEAP OIL BATH FOR THE LABORATORY.

At the recent meeting of the South-West of England District Association of Gas Managers, Mr. N. H. Humphrys exhibited a simple and cheaply-constructed oil bath, for drying small quantities of lime, oxide, &c., and which may also be used for determining quantitatively the percentage of moisture. It was specially contrived by him for ascertaining the quantity of water contained in lime prepared for purifiers. The apparatus consists of an ordinary cylindrical tin canister, in the lid of which two or more round holes are cut, of a diameter sufficient to admit the insertion of a test-tube in each hole; a smaller hole is also provided for inserting a tube thermometer. The substances to be dried are placed in the test-tubes, and the canister being filled with oil to within an inch or so of the top, is heated over a very small Bunsen burner; or an Argand burner turned very low, without chimney, will be found sufficient for the purpose, and it can be delicately regulated. The temperature to which the substances in the tube are exposed may be ascertained by the thermometer, and regulated as required. They may be kept at a little over 212° Fahr., or increased up to 400° or 500°—nearly the decomposing heat of the oil. For the quantitative determination of the water in a sample of lime, a given quantity (say, 50 grains) may be placed in one of the test-tubes. The weight of the tube being taken, the 50 grains may be placed in it, and the weight again taken, to guard against loss in transferring it into the tube. The tube is then placed in the canister, and submitted to a temperature of 300° for an hour or more; it may then be taken out, carefully wiped, and weighed, when the loss of weight as compared with the first weighing will indicate the quantity of water.

A NEW WATER-LINE INDICATOR.

A paper by M. Leclerc on M. Decaudun's water-line indicator, presented to the Société Technique de l'Industrie du Gaz en France at their last congress, describes with much fulness of detail this neat apparatus, which is said to act with remarkable efficiency. The



arrangement, as will be seen by the accompanying figure, taken from the *Journal des Usines à Gaz*, consists of a bell, A, placed at the bottom of the reservoir containing the liquid, the height of which is to be measured, a space, a, being left between the bottom of the bell and the tank, to permit of free access of the liquid to the interior of the former. A tube, B, connects the interior of the bell with the gauge, C. The action of the apparatus is simply pneumatic in principle. The bell and tube being maintained full of air, any alteration in the height, H, of the liquid in the reservoir exerts a corresponding effect upon the degree of compression of the confined air, and this in turn operates on the gauge, which is constructed in accordance with the amount of variation to be shown in every case. When great delicacy is required in order to show slight differences of level, say of the liquid in a hydraulic main, a kind of King's gauge, or a simple water-gauge, is suitable; or for the measurement of water-tanks, tar or liquor wells, &c., a gauge on the principle of the aneroid barometer is adopted. As nothing but air enters the bell and tube, the density or possible foulness of the liquid in which they are immersed does not affect the action of the gauge, which may be at any distance from the remainder of the apparatus, and may also be graduated to interpret the action of the air pressure by which it is actuated, either in terms of the height of the liquid or of the contents of the reservoir. The bell is not usually fixed to the tank, but rests in it by its own weight. The connecting tube is generally of copper, of only 3 millimètres diameter, and is therefore susceptible of being easily laid where required, to actuate one or more gauges. The arrangement may be modified to serve the purpose of an indicator of the height or contents of gas-holders, by fixing the bell to the bottom curb of the holder. The diminution of pressure as the curb approaches the surface of the water would then be shown by the gauge, and the latter might be fitted with an alarm, to call attention to the state of the holder before it could begin to blow.

SIEMENS'S REGENERATIVE GAS-LAMPS.

A recent number of the *Journal des Usines à Gaz* contains a brief notice of the Siemens regenerative gas-lamps, of which we gave a description in the *JOURNAL*, Vol. XXXV. No. 870. These lamps are constructed upon the principle of heating the air required for the combustion of the gas, and also, in a minor degree, the gas itself by the waste heat of the products of combustion. The utility of this proceeding has been much questioned, but our contemporary states that in the Siemens arrangement it gives very satisfactory results. The particular lamp referred to in the present instance gave a light equal to that of about 20 carcel lamps, or 190 candles, with a con-

sumption of 800 litres, or 28·25 cubic feet of gas per hour—equivalent to 40 litres per carcel lamp, or to an illuminating power of 33·6 candles per 5 cubic feet. The illuminating power of the gas as usually estimated is not given, nor is the pattern of the Siemens lamp indicated. The duty thus stated as having been yielded by the regenerative lamp is about double that of the powerful Argand's of the "Phare" type, or of M. Bengel's spheroidal burner.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE ECONOMY OF CARBONIZATION.

SIR,—I hope Mr. G. Ernest Stevenson will excuse me for pointing out one or two little errors in his otherwise well-written article in the last number of the *JOURNAL*.

95 tons 5 cwt. of coal, at 14s., not £66 10s., but . . .	£66 13 6
18 cwt. of coke per furnace, in . . .	
22 settings (not six) . . .	19 tons 16 cwt.
Coke for sale, 42 tons 2 cwt. (not . . .	
42 tons 12 cwt.), at 12s.	£25 5 2
950 gallons of tar	7 18 0
2250 gallons of liquor, at 60s., not . . .	
£6 16s., but	6 15 0
	39 18 2
Net cost of coal	£26 15 4
With 10,500 feet to the ton, against 10,000 feet, costing	27 16 0
Difference only	£1 0 8

I cannot, however, admit that by carbonising $\frac{1}{4}$ per cent. less coals the labour is to be reduced nearly 17 per cent. I doubt if there would be any reduction, for high heats and four-hour charges, if the rule and not the exception, would lead to three shifts of stokers in the course of 24 hours.

The increase from 16 cwt. to 18 cwt. of fuel per furnace is not enough; an increase of 25 per cent. instead of 12 per cent. would be nearer the mark. Thus:

95 tons 5 cwt. of coal	£66 13 6
Coke produced	Tons. Cwt.
18 cwt.	51 18
Less fuel used	22 0
Say 40 tons for sale, at 12s.	£24 0 0
950 gallons of tar	7 18 0
2250 gallons of liquor	6 15 0
	38 13 0
Net cost of coal	£28 0 6
Labour—deduct 5 per cent. off £7 4s.	6 16 9
	£34 17 3

Showing a slight difference of 0·033d. per 1000 feet in favour of the 10,500 feet of gas, which may be more than swept away by increased wear and tear.

In these calculations it must be borne in mind that it is assumed the extra 500 feet of gas per ton of coals is not reducing the illuminating power of the gas below the requirements of the district supplied.

Mr. Stevenson corrects Mr. Livesey under the head of interest on plant. I have to correct Mr. Stevenson thus far: Capital is now almost universally raised by gas companies at from 5 to 6 per cent., instead of, as calculated by Mr. Stevenson, at 10 per cent. However, even at 5 per cent., the interest on saving of capital, at £50 per retort (which includes the retort-house and connections), amounts to one-eighth of a penny per 1000 feet in favour of the 10,500 feet of gas. Where a gas company has only a small margin of retorts in excess of actual requirements, high heats will pay, and will save off the increase of dead capital, which, in a moderate-sized works of, say, 50 to 200 millions, always arises with an extension, such as building a new retort-house. If we could limit our increase of capital to £50 for each additional retort wanted for increased business, we should avoid dead or unproductive capital in the retort-house; but this cannot be done.

R. H. JONES.

Nov. 11, 1880.

THE LIGHTING OF THE QUEEN STREET STATION, GLASGOW.

SIR,—Referring to the remarks of your Glasgow correspondent, in the last number of the *JOURNAL*, with respect to the lighting of the new station of the North British Railway in Glasgow, permit us to confirm his statement that the lamps were "actually ordered from the Leeds firm" six weeks ago, and to add that they are now being rapidly supplied by us.

Perhaps the most interesting feature connected with the two systems of lighting being placed in competition is the opportunity it affords for the electric light being tested as to cost and utility in comparison with gas lanterns of improved construction for lighting railway stations. No doubt the results will be awaited with interest.

G. BRAY AND CO.

Leeds, Nov. 13, 1880.

THE AITKEN AND YOUNG ANALYZER.

SIR,—In "Notes from Scotland" by your Edinburgh correspondent, as appearing in the *JOURNAL* of the 9th inst., some strong remarks are made as to the want of appreciation of the Aitken and Young Analyzer by those connected with the gas interest in Scotland; but to many it appears very strange that, after the issuing of such a favourable report by a Committee of the West of Scotland Association of Gas Managers, no sound has been heard of its success, nor any paper, so far as I know, has been read at any of our late meetings giving the results of its use at any gas-works in Scotland. What is wanted is more infor-

mation as to its utility in actual working, before committing ourselves to the great expense of the erection of the necessary machinery.

If either of our Scotch correspondents can give any information where one in actual operation can be seen; or state positively if Mr. Stirling of Glasgow, or any of the members of the Glasgow Water-works at Hamilton and issued forth so flaming a report, which has evidently set on fire the imagination of our correspondents, has had the analyzer fitted up in his works, a favour will be conferred on

Nov. 12, 1880.

AN OLD SUBSCRIBER.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

THURSDAY, NOV. 11.

(Before the MASTER OF THE ROLLS.)

IN re the SHEFFIELD WATER-WORKS COMPANY v. BINGHAM.

This action involved the question whether the Sheffield Water-Works Company are entitled, under their Act of Parliament, to make a special charge for water supplied by them to fixed baths in private dwelling-houses. The Company were incorporated by an Act of 1850, in the provisions of which were repeated in the Sheffield Water-Works Act of 1853. The 79th section of the Act requires the Company to furnish a sufficient supply of water to every inhabitant occupying a private dwelling-house or part of a dwelling-house in any square, street, close, or lane, or any other place, or thoroughfare, or in any other place, at within the limits of the Act, by means of the pipes of the Company then or might thereafter be laid, for the use of his or her family, at the following rates—viz., where the rent of the dwelling-house does not exceed 47 per annum, at a rate of 6 per cent. per annum on the rent, but not in any case to exceed 7s. 2d. a year; and where the rent amounts to 47, but does not exceed 75, a rate not exceeding 8s. 2d. a year. The maximum charge for houses rented between 8s. and 10s. is 10s. per annum; between 10s. and 12s. 6s. per annum; between 12s. 6s. and 15s. 14s.; between 15s. and 18s. 16s.; between 18s. and 20s. 18s.; between 20s. and 25s. 21s.; between 25s. and 30s. 24s.; between 30s. and 35s. 27s.; between 35s. and 40s. 30s.; between 40s. and 45s. 33s.; between 45s. and 50s. 36s.; between 50s. and 60s. 42s.; between 60s. and 80s. 48s.; between 80s. and 100s. 54s.; and from 100s. and upwards the rate progresses in like proportion—with the proviso that the Company shall not be entitled to receive from any inhabitant more than the sum of 7s. in any one year, nor be obliged to furnish a supply of water to any inhabitant for less than 7s. 2d. a year. By section 9, it is provided that in the case of schools, manufactories, dyers, printers, bleachers, brewers, innkeepers, livery-stable keepers, and other persons requiring a supply of water for other purposes than domestic consumption, the Company may make a special charge for water, and may also, for the purposes of any trade or business whatsoever, such supply shall be furnished at the following rate, viz.—A rate not exceeding 10d. for every 1000 gallons supplied up to 500,000 gallons per annum, and where the quantity exceeds 500,000 gallons, but does not exceed 1,000,000 gallons, the rate is not to exceed 8d. for every 1000 gallons, and where the quantity exceeds 1,000,000 gallons, but is less than 1,500,000 gallons, then the rate is not to exceed 6d. for every 1000 gallons of the excess beyond 1,000,000 gallons. Where the supply is between 1,500,000 and 2,000,000 gallons a year, the rate is not to exceed 7d. for every 1000 gallons of the excess beyond 1,000,000 gallons, and where the quantity exceeds 2,000,000 gallons the maximum charge is fixed at 6d. for every 1000 gallons of the excess. A proviso attached to the clause enacts that in the case of stables, or premises in which horses are kept, attached to or occupied with any private dwelling-house, the water-rate shall be desired, and the Company shall be bound to supply water to the dwelling-house, including the rent of the stables or premises. The 82nd section provides that the Company shall not charge more for any one year than the several rates specified in respect of water-closets belonging to any private dwelling-house, these rates being 4s. when the annual rack-rent of the house exceeds 100s. and 3s. when the annual rack-rent for any other when the rent is between 10s. and 25s.; and 6s. for one when the rent is between 25s. and 50s. and the charge of 4s. for each additional closet being continued through the ascending scale. The rate for the first is to be 7s. 6d. upon a rental of between 450 and 500s. and 10s. for a rental of 500s. and upwards. The 84th section of the Act of 1853, and the 79th section of the Act of 1853, for the water supply to his house being 43s. on the rent, plus the 35 per cent. added by the authority of the Company's Act of 1853. Since June 10th, 1878, the defendant had positively refused to pay anything in respect of the water used in his bath. On the 12th of November, 1879, the plaintiffs were paid for payment of £1 17s. 6d. for the water used in the bath since June, 1878, and requested defendant to pay for thereafter either at the composition rate of £1 10s. per year, or to consent to the rates then in force. The defendant, however, persisted in his refusal to pay anything in respect of the bath supply, and the Company accordingly brought this action to establish their title to make the charge. The defendant contended that according to the proper construction of the Water-Works Clauses Act of 1847, and the Sheffield Water-Works Act of 1853, he was entitled to use the water for the bath as part of the domestic supply, and therefore, without additional payment. The plaintiffs claimed on account of the quantity of water supplied by them, and used in or by means of the bath, from the 24th of June, 1878, till the trial of the action, and that the defendant might be ordered to pay for it either at the composition rate of £1 10s. per year, or to consent to the rates then in force. The defendant contended that, since June, 1878, or at the statutory rate prescribed by their Act of 1853. A declaration was prayed that the defendant was liable to pay for all water supplied by the plaintiffs and used by the defendant in his bath, and an injunction was also sought to restrain the defendant from keeping the bath connected with the water-pipes, such a manner as to be able to divert water from such pipes to his bath, and from in any manner drawing the water supplied to the defendant or using it in his bath except

upon the terms of his paying for it in the manner provided, or except through a proper meter to be fixed by the plaintiffs. If the statement of defence defendant pointed out that the Company's special Act of 1853 had not provided, in the case of baths in private dwelling-houses, any rate for payment, and argued, therefore, that it was the obvious intention of the Legislature that no extra payment was to be made for the purpose. If extra payment for baths in private dwelling-houses had been intended, a rate for payment would, he argued, have been found in the special Act, and provision would have been made for the expense of putting up meters to measure the supply. It was because the Company could not reasonably either bear themselves or impose on their customers the expense of meters for baths that they devised their scale of composition rates, and no payments had been made to them for private baths except on the composition scale. He denied ever having seen the composition scale, which he alleged was arbitrarily fixed by the plaintiffs, and was excessive. His bath was filled and emptied by pipes attached to it, and it was used for domestic purposes only. Mr. private houses in Sheffield where both the plaintiffs and defendant without the agency of pipes, no charge was made by the plaintiffs, nor did they charge for water used in basins and emptied through pipes connected with the plaintiffs system. The defendant resisted payment on the ground that the plaintiffs were not entitled, under the Acts referred to, to charge for the water used in the bath, and he denied that he had defended this action on public grounds, and for the purpose of getting a legal decision on the question raised.

Mr. BAGSHAW, Q.C., and Mr. B. B. ROGERS appeared for the plaintiffs; Mr. CHITTY, Q.C., and Mr. BUCKLEY for the defendant.

Mr. BAGSHAW, in opening the case, said the action was brought to raise the question, and all parties were desirous to have the decision of the Court on the effect of the Company's Act as to the right it gave them to charge extra for baths, &c. It turned upon two sections of the Act of 1853. He then detailed the sections, as given above.

The MASTER OF THE ROLLS asked the question, was it as to whether the Company could charge for a bath in a private house.

Mr. BAGSHAW: Yes; a fixed bath in a private house.

The MASTER OF THE ROLLS asked how they were to find out whether a man had a fixed or an unfixed bath.

Mr. BAGSHAW: That was the question about that. As a matter of fact it was quite obvious that when a bath was not fixed, but was filled by hand, it was not to be charged.

The MASTER OF THE ROLLS: A man has a bath, and when he wants to use it he puts on a piece of india-rubber hose to supply water to it.

Mr. BAGSHAW: He had no right to attach a hose. There was a clause in the Act against that. The Company here claimed in respect of a regular bath.

Mr. CHITTY: But you do not claim for a fixed basin.

Mr. BAGSHAW: A fixed bath is not a fixed basin.

The MASTER OF THE ROLLS: How do you find out how much water is supplied?

Mr. BAGSHAW: By means of our parliamentary powers to attach meters. We have meters which determine the supply of water. Wherever there is a right to charge for water there is also in the Act a power to enter, and so forth.

The MASTER OF THE ROLLS: Do you mean to say that you have a right to charge for water-closets?

Mr. BAGSHAW said he did, and he was going to apply that test. Their Act authorized the Company to make additional charges. His lordship would understand that his friend would have to find something to qualify the words about baths, but he should ask his lordship to take the words as they stood.

The MASTER OF THE ROLLS: Do you charge for water-closets really?

Mr. BAGSHAW said the Company did; but there was a maximum imposed by section 82, which assumed that they were entitled to charge for water-closets. He would not charge for water-closets, but he would charge for the Company would, under section 79, be bound to supply a closet, and horses and carriages. Section 81 gave them the power to charge extra for baths, carriages, business, trade, and other things. Then the proviso at the end of section 81 took in stables, and premises attached to or occupied with a private dwelling-house. The defendant was to be assessed on the amount of the rent of a private dwelling-house. That seemed to be conclusive. There was an authorized charge for horses and carriages attached to a private dwelling-house.

The MASTER OF THE ROLLS: The first section says the Company shall not charge more than a certain sum, and the second section says they shall be entitled to charge; it does not say an additional charge.

Mr. BAGSHAW said, first, the water supplied was for domestic purposes generally; then for certain specified purposes there was an additional charge. This was plain, else what was the additional charge for? It was not to be found anywhere except in the one section.

The MASTER OF THE ROLLS: You have a power to supply by meter.

Mr. BAGSHAW said they had. It was quite clear under this section that the Company might make an additional charge for water required for horses and carriages. He took it that, if he had a right to charge by meter, he would be bound to put a meter in, the quantity would have to be ascertained as best it could.

The MASTER OF THE ROLLS inquired if the Company were incorporated.

Mr. CHITTY: Yes, by the Act of 1853.

Mr. BAGSHAW said he would quote section 12—where the undertakers were authorized to supply water for other than domestic purposes, they should not be liable in certain cases. There was a reference to water being required for fountains or ornamental purposes, which meant that a supply of water for domestic purposes was really a supply of water for horses and carriages. It had been decided that the supply of water for a private dwelling-house included under the name of the water was entitled to make. It was plain, therefore, that section 81 dealt with matters that would be included in section 79, and they had a right to charge an additional rate. His friend's argument seemed to be that because the bath was in his house he would be liable to be charged a higher rate.

The MASTER OF THE ROLLS: It was a new matter, and he did not see that a higher rent could be charged. If Mr. Chitty alleged that he was charged a higher rent he must show that the mere fitting up of a room as a bath-room without pipes for a bath increased the rent.

Mr. BAGSHAW said if it were so fitted the room would be withdrawn from ordinary use.

The MASTER OF THE ROLLS said he should very much doubt whether it would add to the letting value of a house.

Mr. CHITTY said his friend was moving upon the pleadings.

The MASTER OF THE ROLLS said he was. The simple question was, as he understood it, had the Company a right to charge extra for a bath? This was the contention. He would call upon Mr. Chitty, for the defendant, to address him.

Mr. CHITTY said by the 79th section of their Act the Company were bound to furnish a sufficient supply of water for the use of a family.

The MASTER OF THE ROLLS: It is clear that whatever is in the 81st section is additional to that in the 79th.

Mr. CHITTY said the scope of the 81st section referred to the supply of

water for other than domestic purposes. The marginal note to the Act was, "for the supply of water for other than domestic purposes."

THE MASTER of the ROLLS: It very often happens that changes take place, and the sections are amended, but the marginal note is overlooked altogether, and remains without alteration.

MR. CHITTY contended that it was clear that section 79 entitled the defendant to a supply of water for his bath, whether moveable or fixed. The words of the Act upon which he should rely were, "for the use of his or her family," and there was in the Act a requisition on the Company to supply water to every inhabitant sufficient for his or her use. The inhabitants were therefore entitled to have a supply sufficient for the use of their own houses, which would include a bath.

THE MASTER of the ROLLS: I do not know how you can make out what quantity is sufficient for the use of a family. It appears to me that the Act is very imperfectly drawn, because if it is confined to the use of "his or her family," then it would exclude the supply necessary for any visitors. Then, again, supposing a man keeps lodgers, is he to be prevented from supplying them with water because they are not members of his family? The language of the Act is very imperfect, and it would be impossible to argue upon the literal meaning of the words in that way. Whatever could be charged under section 79 could be charged under section 81, and the point is what that section really means.

MR. CHITTY said the Act was not very correctly framed, or he would not be before his lordship. Section 79 commenced with a clear obligation on the Company to furnish a supply of water for domestic purposes, and then section 81 said that a supply should be furnished by the Company to schools, dyers, and so on at such per gallon rates. That applied, of course, to tradesmen who, in the course of their business, used an enormous quantity of water.

THE MASTER of the ROLLS: The Company have the monopoly, and of course they are bound to supply all the inhabitants, whether tradesmen or not. It would be monstrous if they were not bound to do so.

MR. CHITTY said that where there was a supply for domestic use it was to be paid for in the shape of a rental, and not at so much per gallon.

THE MASTER of the ROLLS: Take the case of a school. Has the schoolmaster to pay twice over for his water supply, once in the shape of rental, and again at so much per gallon? What is the practice of the Company? Mr. BAGSHAW, with reference to schools, manufactories, dye-houses, and so on?

MR. BAGSHAW: We supply them by meter.

THE MASTER of the ROLLS: Do you mean to say that in the case of persons requiring a supply of water for other than domestic purposes, you take the case of a distiller—you would charge him rent as well as per meter?

MR. BAGSHAW: I have had a private dwelling-house in connection with his place of business he would be charged accordingly, but in respect of the supply of water for his business he does not use 1000 gallons, and he takes the case of a distiller—he would charge him rent as well as per meter?

THE MASTER of the ROLLS: It appears to me perfectly plain that section 82 is what we call a cutting-down clause on 81. The Company are not to charge any more than they were previously empowered to do. They can charge as much as they like, but they do not use 1000 gallons, and surely there must be water-closets which do not require so much. As Mr. Chitty has pointed out, if the thing were plain he would not be here at all. Until quite recent times a bath was considered a great luxury in a house—in fact, so recently as 30 years ago houses of very considerable value in London were built without a bath.

MR. CHITTY said he contended that the defendant paid on the additional rental in respect of the private bath-room, because the value of the house was increased thereby.

THE MASTER of the ROLLS: If you use a bath it appears to me you are within the section.

MR. CHITTY said it might be a large bath, not fixed but moveable.

THE MASTER of the ROLLS: You cannot avoid payment because the bath is not a fixture.

MR. CHITTY said the plaintiffs wanted to construe the word "bath" in the widest sense, so as to comprehend not only a bath used for domestic purposes in a private dwelling-house. By the 12th section of the Act of 1853 it was provided that payment should be made for water used for horses and carriages in connection with private houses, but this was on the rental of the stables. What his friend's contention amounted to was this—that the defendant was to pay twice over, once by the gallon and again on the increased value of his house.

MR. BUCKLEY said the 81st section began by specifying schools, manufactories, and so on requiring water for other than domestic purposes, and who were not within section 79, which only dealt with the inhabitants of private dwelling-houses.

THE MASTER of the ROLLS, in giving his decision, said: I see no reason for departing from my rule of construing the words of an Act of Parliament according to their plainest apparent meaning. There is no context here to cut down the force of the words used, and I therefore give them their full meaning, without troubling myself to go into the questions of difficulty which have been suggested at the bar. Almost every enactment of this kind, if we trace it out to its ultimate consequences, may be found now and then, in particular cases not contemplated by its framers, to lead to difficult and even absurd conclusions. But the fact that there are possible cases which look absurd is no reason why we should not give the plain meaning to the language of the Act. Section 79, as I have said, requires the Company to furnish a sufficient supply of water, for every inhabitant, for what I may call ordinary domestic purposes. These are not the words of the section. The section is not at all well worded, but that is what I understand it to mean. The wording is very peculiar, for the plain meaning requires the Company to supply every inhabitant of every house, as one would think it should be—with water for the use of his or her family. Well, I am satisfied that the word "family" must have a very large meaning, including the household, and though the section says every inhabitant, the meaning must be the supply of water to the house, and I should have held, if there had been no other section, that the words covered all ordinary domestic purposes, including, therefore, the use of water for a bath or water-closet. Then there is section 81, which, as I read it, entitles the Company to charge, over and above the rate imposed in section 79, for certain things, and it entitles them to charge, in substitution of the charge provided by section 79, for certain other things. I have rather inverted the order. As I understand it, the case of the first class includes schools, manufactories, dyers, printers, bleachers, brewers, innkeepers, livery-stable keepers, ale-house keepers, and other persons requiring a supply of water for other than domestic purposes. These are "other people," and, obviously, by the very words, must include private persons, because it is not requiring a supply of water for baths for the purpose of a trade or business, but it distinguishes between domestic purposes and the purposes

of trade and business. Consequently, it appears to me that the first words are obviously applicable to persons who do not carry on any trade or business. Well, that being so, is there any difficulty about the words "baths, ponds or pools, or closets?" Let us see what it is. Bath is a well-known term, and the meaning of "pond" is well known. By "pool" evidently is meant a small pond, as distinct from a pond, and the supply of water to a closet can only refer to a water-closet. If this is so, then the Company are by their Act entitled to charge a rate not exceeding 10d. for every 1000 gallons so supplied, that is for those particular purposes. I see no difficulty about this. Then there is a proviso which, if wanted at all, would make the purpose clear, though I do not think it is wanted at all. But it is plain that in the case of stables or premises in which horses or carriages are kept, attached to and occupied with any private dwelling-house, the water-rate shall, if desired by the occupier, be assessed upon the amount of rent of the private dwelling-house, including the amount of rent of the stables or premises; and the Company shall not in such case be authorized to make the additional charges authorized in respect to the supply of water for such horses and carriages. So here it is plain that a man who does not carry on a trade or business is intended by section 81 to pay, but subject to this, that if the stables are attached to and occupied as a private dwelling-house, and he at his option may require them to make him pay on the rent, and not according to the supply, but if he does not exercise the option, he is to pay as on a private dwelling-house. Therefore there does not appear to me to be any real difficulty in seeing that it is intended that the supply to a bath, cesspool, or water-closet was to be paid for separately. There is yet another section which confirms this view, it is needed for the purpose of a water-closet or cesspool. At this time there is no mode of measuring it but by putting a separate meter for each house, though such authority has been given by the Act of Parliament. But the Act does not say that the water shall be measured. You can prove the quantity used without measurement—you can show that a bath contains so much water, and that it is used on the average so many times in a year—with sufficient accuracy to get damages from a jury based on such calculation. There are many problems which are more difficult than this. The same observation applies to cesspools and water-closets. If such evidence can be given of the quantity of water used for the purpose of the rate, it appears to me that the Company are reasonably entitled to make a charge, under the authority of the 81st section, upon private dwelling-houses for water supplied to baths.

MR. BAGSHAW: Then I will ask for a declaration in the terms of the third section of the prayer. Of course the defendant has the alternative either to pay according to measured quantity or at the composition rate of 41 10d. a year on his rental.

THE MASTER of the ROLLS: He is liable to pay for what water is supplied to his bath in excess of 1000 gallons a year.

MR. BAGSHAW: He cannot surely want to have it proved by evidence that the bath is in excess of 1000 gallons.

THE MASTER of the ROLLS: He is entitled to an inquiry if he wishes it. MR. CHITTY: Mr. Bingham's is a representative case, and he may desire to carry it elsewhere.

THE MASTER of the ROLLS: I should be glad indeed if he would.

MR. BAGSHAW asked for costs, as he understood that the defendant had £100 in his pocket.

THE MASTER of the ROLLS said the plaintiffs were entitled to costs.

MR. CHITTY observed that there was nothing in the statement of claim about excess over 1000 gallons.

MR. BAGSHAW pointed out that by the defence the plaintiff admitted that if his bath supply was chargeable at all under the Act, he was liable to make some payment; but he represented that the payment demanded was largely in excess of what he would have to pay under section 81.

MR. CHITTY did not think it would be worth while to go into an inquiry as to the quantity used.

THE MASTER of the ROLLS, as the arrears only amounted to £3, fully endorsed this view.

MR. CHITTY said he was brought there simply upon the pleadings, and there was nothing in them about the 1000 gallons.

MR. BAGSHAW admitted this, but asked, as an appeal was threatened, that the plaintiffs might have liberty to amend their statement in this respect.

THE MASTER of the ROLLS: You may consider it as amended, and take the order for the payment of the £3, or, at the option of the defendant, an inquiry as to quantity.

LAMBETH POLICE COURT.—FRIDAY, NOV. 12. (Before Mr. ELLISON.)

OPONENTS OF THE CONSTANT SUPPLY SYSTEM.

William Snell, of Falmouth Road, New Kent Road, a member of the Vestry of St. Mary, Newington, and owner of house property in the parish, appeared on an adjourned summons, taken out by the Lambeth Water-Works Company, for neglecting to comply with the regulations regarding a constant supply of water to houses, of which he was owner, in Ingoldthorpe Grove, Glengall Road. The facts of the case were gone into a fortnight since, before Mr. Hosack, and were reported in the JOURNAL (see ante, p. 690).

MR. BRESLEY again appeared for the Company, and pointed out to Mr. Ellison that, although the defendant had to a certain extent complied with what was required, he had entirely cut off all water supply to the closets of his house. This, he said, was in itself a very bad feature in the case, for prior to these proceedings there was a supply of water to the closets.

MR. H. J. Catmur, the Chief Inspector to the Company, gave evidence in support of the statement of Mr. Bresley. The defendant said that he was not bound, under the Company's Act, to supply water to the closets, and the Company had no power to compel him to do so. It was the Sanitary Authority who had control in such a matter.

Mr. ELLISON told him he could put any questions to the witnesses, and make his statement at the proper time.

Mr. BESLEY wished to point out the course particularly adopted by the defendant in cutting off the supply of water to the closets—a matter which, as a vestryman, he must know was highly improper.

Defendant proceeded to repeat his statements with regard to the authority of the Company, and then condemned Water Companies entirely.

Mr. ELLISON told him he was not answering the complaint, and certainly doing himself no good. He had, he said, promised to comply with the regulations, and the case was adjourned for him to do so. Instead of that he had chosen to deprive his tenants of a most necessary supply of water, especially in a sanitary point of view. He (Mr. Ellison) wanted to hear what defendant had to say to this.

Defendant proceeded, in a warm manner, to express his views upon the question of the water supply and the present Companies.

Mr. Eliason stopped him, stating that he was not to consider he was addressing a public meeting, or speaking in the Vestry. It was a very serious case. An offence had been committed, and despite the fact of the Company giving the defendant an opportunity to do what was required, he had been disobedient. He had been told to go to the Vestry, and to the closets. It had, on the first hearing, been suggested that a nominal penalty only would be asked for by the Company. To this he should certainly not agree, but would support the Company, who had a right, in the interests of the public, to see their regulations carried out. Nothing, however, had been stated by the defendant, and, having acted in a shameful and flimsy manner in cutting off the supply, he must pay a penalty of 4s and 6d for the costs.

Defendant said he should appeal against the decision.

Mr. BESLEY pointed out that, independent of there being no proper fittings, the waste of water had been at the rate of about £2 per day during the past nine months. The defendant was a member of the Lambeth Vestry, and, despite every notice given him, nothing whatever had been done with regard to complying with the regulations.

Evidence having been called in support of this statement, Mr. ELLISON ordered the defendant to pay a fine of £1, and £1 13s. costs.

Another summons against *James Law*, with regard to houses in Wickham Street, was allowed to stand over on his undertaking to do the

Mr. ELLISON remarked on the importance of a constant supply of water, and intimated that if defendant did the work there would be but a nominal penalty, otherwise the full fine would be imposed.

Miscellaneous News.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS
AND MANAGERS.

The Quarterly Meeting of this Association was held on Thursday last, at the Guildhall Tavern, London—Mr. JAMES HUNTER, the President, in the chair.

The minutes of the previous meeting having been read by the HONORARY SECRETARY (Mr. J. L. Chapman, of Harrow) and confirmed.

The President said the balance-sheet for the year, which had been audited by Messrs. Farrand and Price, showed a balance in hand of £24 18s. 3d.—a most satisfactory state of affairs.

The next business was the election of President for the ensuing year, and the Committee recommended Mr. W. H. Broadberry, of Tottenham, for this office.

The President said he had much pleasure in proposing Mr. Broadberry for President, having known him for many years. In a practical knowledge of gas-making, which was a very important consideration, he believed he stood second to none.

Mr. J. ELDRIDGE (Richmond) seconded the resolution. He said that Mr. Broadberry was not only a practical gas maker, but had taken an active part in the formation of the Association, and in its proceedings ever

The resolution was put, and carried unanimously.

Mr. BROADBERRY, in thanking the members for the honour conferred upon him, said he should use every effort to carry on the business of the Association as it had been carried on in the past, and to fulfil the duties of President in a satisfactory manner.

The PRESIDENT next proposed the re-election of Mr. A. H. Wood, of Hastings, as Treasurer.

Mr. C. E. BOTLEY (Wormwood Scrubbs) seconded the motion, saying that Mr. Wood might also be considered one of the fathers of the Association.

The resolution was carried unanimously.
On the motion of the PRESIDENT, Mr. W. A. Valon (Ramsgate) and Mr. J. Chapman (Great Stanmore) were elected on the Committee, in place of members retiring.

The President then proposed the re-election of Messrs. Farrand and Price, the Auditors.

Mr. J. CHAPMAN seconded the motion, which was carried unanimously. The PRESIDENT next proposed the re-election of Mr. James L. Chapman as Honorary Secretary.

Mr. W. R. COOPER (Banbury) seconded the motion, and it was carried unanimously.

ELECTION OF NEW MEMBERS.

Mr. G. Garnett (Ryde), Mr. H. Eldridge (Northfleet), and Mr. F. D. Marshall (Brentford), were elected members of the Association.

Mr. D. F. GODDARD (Ipswich) then read the following paper:—

MANUFACTURE OF SULPHATE OF AMMONIA.

In bringing this subject under the consideration of AMMONIA, we have to apologize for dealing with matters on which so much has already been written; but it appears to me that there are comparatively few gas managers who, as yet, are working up their ammoniacal liquor, while so many are still burning it. I have, therefore, thought it well to devote your time by going into the question of washing or scrubbing gas, nor enter upon a minute description of the apparatus used in manufacture—this having been so efficiently done by the late Mr. Esson, of Cheltenham, in his paper on "The Manufacture of Ammonia," which is published, as also in the article in "King's Treatise on Coal Gas"—but briefly to compare the different methods in use, with a view to ascertain the most economical, as well as the most economical means of making sulphate of ammonia.

The systems adopted for this purpose are many and varied, but the principles on which these systems work are few and simple. Omitting the most primitive method—namely, that of mixing the acid and the liquor in a lead vessel and evaporating down the resultant liquid to

crystallization—as obsolete, on account of its nuisance, danger, and expense, I find there are mainly two, and very often three, operations in every system, viz. :—

1. A system for obtaining the ammonia from the liquor in a gaseous form.
 2. An apparatus for fixing the ammonia vapour with sulphuric acid.
 3. An evaporating pan to reduce the liquid sulphate of ammonia to the crystallizing point, and sometimes a means of breaking up the fixed salts of ammonia—the cyanides and sulpho-cyanides—which will not be given off by the simple application of heat.
- I think it will simplify the discussion to follow, if I consider each operation *per se*, rather than deal with complete processes.

First, then, the means of obtaining the ammonia in a gaseous form. For this purpose some use an ordinary egg-ended boiler, or, at all events, a boiler without internal flues, into which the liquor from the works is placed. It is heated either by the direct action of a fire over which it is set, or by the introduction of steam into the liquor; the latter way being decidedly preferable, except on works too small to have a steam-boiler. The heat must be applied slowly at first, until the carbonic acid and other noxious vapours are all driven off; the ammonia vapour, as formed, then passes into the condenser, and is there condensed. When the ammonia is all driven off, some line is introduced into the boiler to break up any fixed salts of ammonia which may remain in solution.

Others use a column, after the design known as a Coffey still, containing many shelves, over which the liquor, entering at the top, passes, traversing each shelf in succession until it reaches the bottom, where it finds an outlet. The steam enters near the bottom, and passes also over the trays, but in an inverse direction, heating the liquor, and causing it to give up its volatile ammoniacal vapours, which, with the steam, pass out at the top. The liquor, thus heated, passes into another vessel, where it is heated, the liquor from the still should be passed into another vessel, and heated or stirred up with lime, to ensure no ammonia being lost as fixed salt.

advantage, but these no amount, so long as the former has the one advantage over the other. Thus, it seems that the former has the one advantage in dealing with the foul salts of ammonia in the same operation as the volatile salts; while the latter requires another operation for this purpose; but, in my opinion, this does not compensate for the other advantages gained by using the Coffey still—namely, a saving of fuel by not having to heat so large a volume of liquid; less danger of nuisance from the foul gases (these, being given off more regularly and in smaller quantities, may be effectually burnt in the boiler furnace); and from its being almost a continuous process—there being no boiler to empty and refill—more work in a given time.

Secondly, the apparatus for fixing the ammonia vapour with sulphuric acid. This, commonly called the saturator or absorber, is also of two forms, which may be designated the open or crystallizing saturator and the closed saturator. The open saturator is a cylindrical vessel, 12 to 14 inches in diameter, lined with 14 lb. lead. Half the top is covered over and divided from the other part by a lead partition, which descends nearly to the bottom. Into the covered portion the pipe from the still enters, and lies horizontally, so that the ammonia gas, as it issues from the still, is forced into the acid, while from the cover there rises a pipe to carry off the carbonic acid and sulphuretted hydrogen evolved. Some mother liquors and water are put into the open portion, and the acid being added constantly as needed, and of such a strength as to produce crystals which are lifted out and placed on a drainer. With the boiler arrangement of still this goes on as long as the acid is driven off; with the Colley still it may be continued as long as desired.

If the closed saturator may be of similar construction, with the simple difference that the acid is also covered in and quite tight. A charge of sulphuric acid put in it, care being taken that the acid is not too strong, or crystallized will be formed in the saturator—a result to be particularly avoided. I find acid of from 40° to 50° Twaddell the best strength. When the charge has been neutralized, as is ascertained by testing, it is run off through a regulus cock or lead plug into an open vessel, where any foreign matter or dirt may settle. Thence it is passed on to the evaporating pan, where, by means of steam-pipes, it is reduced to its crystallizing point, and the sulphate taken out as formed, and placed on a drainer.

The treatment of the carbonic acid and sulphuretted hydrogen is similar in both forms of saturators. The pipe conveying them may, I believe, be advantageously intercepted with another box containing sulphuric acid, to arrest any ammonia that might be taken up with the foul gases; but I cannot speak from experience on this matter. It must then pass through some form of condenser, and the uncondensable gases are carried into the boiler furnace or into the fire of the retort stack.

In comparing these two methods of fixing the ammonia, it would appear that what is done in the open saturator in one vessel requires three vessels when using the closed saturator. The former is therefore undoubtedly the cheaper to erect, and probably the more suitable for small works. Where it is desirable to make white salts, the results are more uniform when obtained by using the wet acid saturator and evaporating pan rather than that in which strong acid is used, as this tends to char and blacken any organic matter that may be present. It will also be more difficult to maintain the highest percentage of ammonia in the salts where these are taken from a strong acid solution, as the acid which hangs to the crystals would increase the weight, besides rendering the salts more impure. The method of using the closed saturator is also in some ways excellent white sulphate produced by Mr. Browning, of Colchester, with the open saturator.

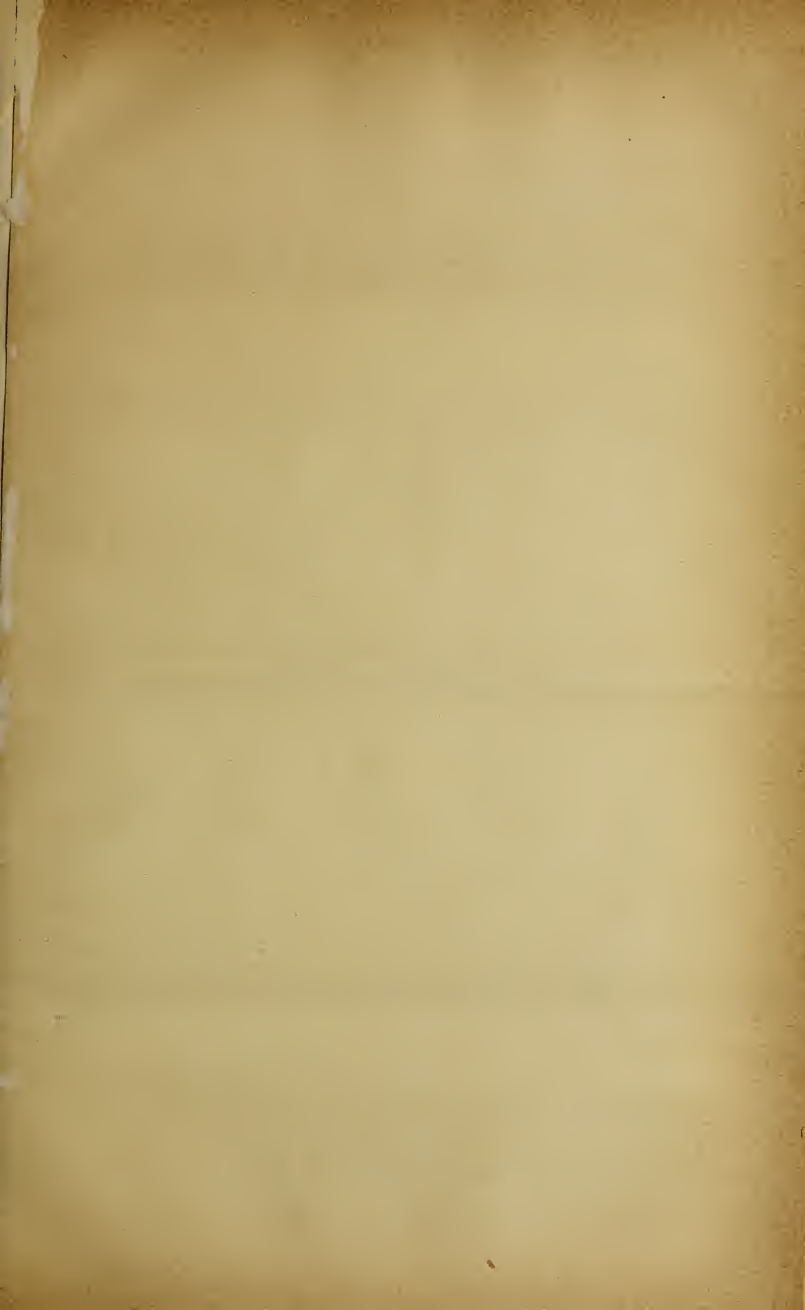
To come to the points of most importance to gas managers. Is it better to sell the ammoniacal liquor than to erect plant and manufacture sulphate? I think, with few exceptions, certainly the latter. Where works are so situate as, by water carriage and proximity of manufacturers, to command such a price as 1s. per ounce per butt, or say 90s. per ton, it would, I should think, be wisest to let well alone; but this is not the case in such offers, as the above, where the body of the liquor is so small. I have seen, in the case of such offers, it will be found highly advantageous to manufacture and sell the produce, as the following figures will show; they are based on a fair week's work, although the quantity produced could be increased by working for a greater number of hours:—

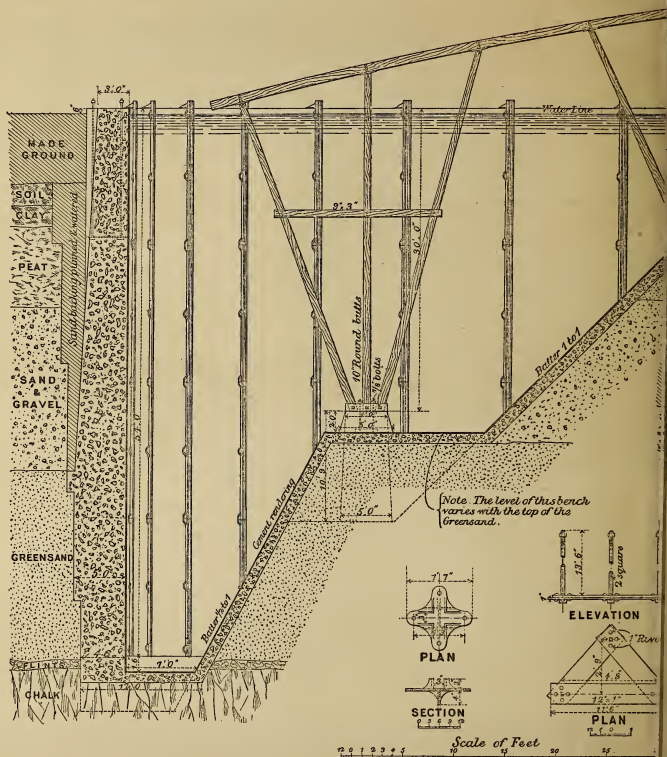
Three tons of sulphate, at £18 5s. per ton	£54 15 0
Labour (one man), at 10d. per cwt.	£2 10 0
Fuel (rough breeze) 52 cwt., at 9s. per ton	1 3 5
Acid, 3 tons, at 70s. per ton	10 10 0
Repairs, &c., 15 per cent. on £500	1 8 9

	15 12 2
Balance of profit	£39 2 10

I estimate that it is possible to produce 100,000 gallons of 10-oz. liquor to produce 3 tons of sulphate—that is, 80, butts, at 15. per ounce per butt, £40, showing at that price a slight advantage in favour of selling the liquor.

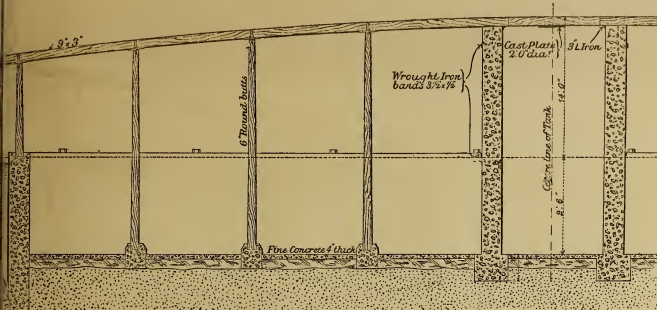
As to the question of the best apparatus to use. In small works, a boiler set over a furnace, with the crystallizing form of saturator, would, no doubt, be cheapest and best; but in works where the quantity of liquor to be kept the apparatus generally used is a Coffey still and saturator. I should recommend the Coffey still and re-circulating saturator, as being most economical, most continuous, and requiring least attention.



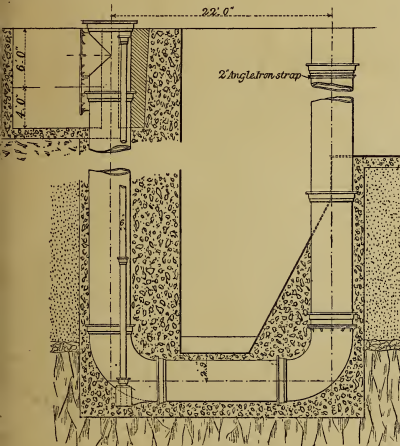


CONCRETE TANK, 216 FEET

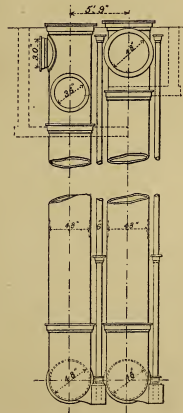
PANY-OLD KENT ROAD WORKS.



SECTION ON LINE A-B

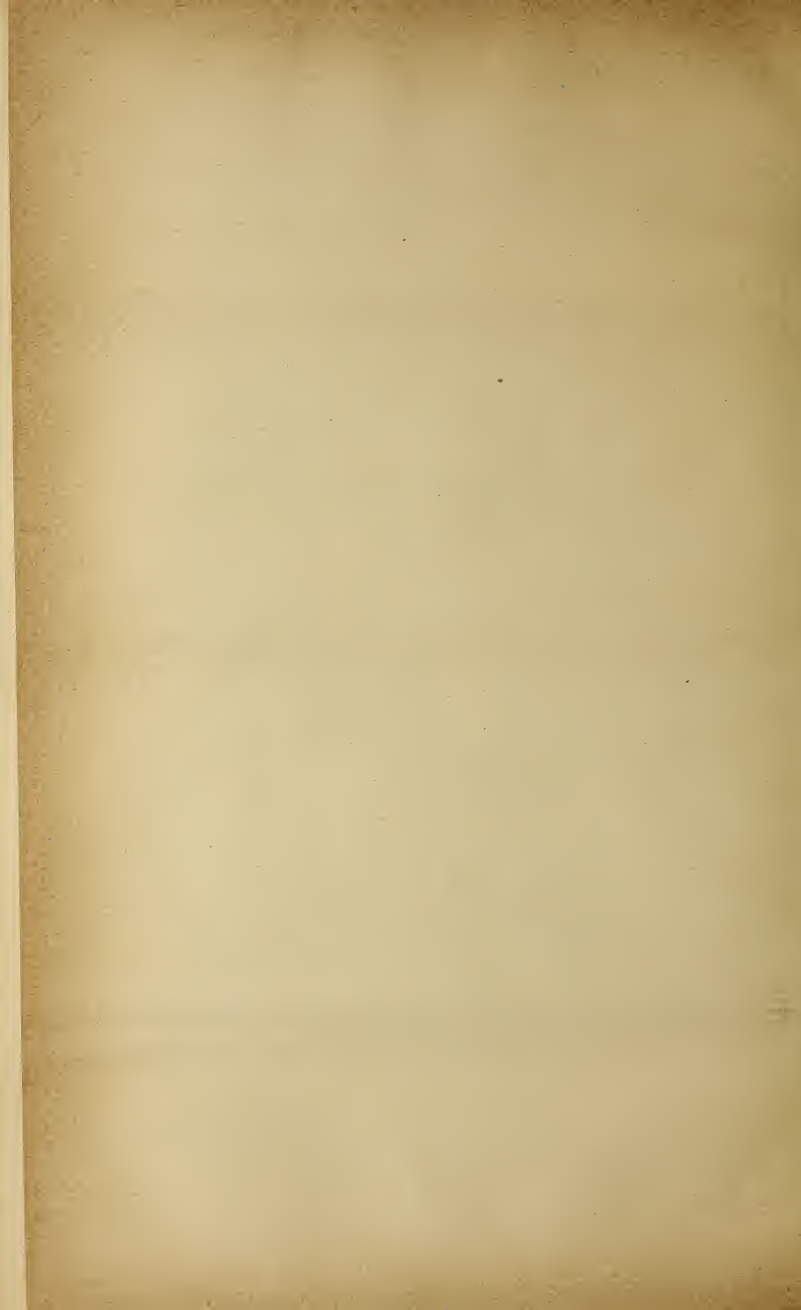


DETAILS OF INLET AND OUTLET PIPES



GEORGE LIVESSEY, M.Inst.C.E., Engineer.

AMETER BY 55 FEET DEEP.



no smell at all, even working with a perfectly open saturator, although, at a matter of precaution, they had the pipe fixed with a stop at the top of it to the furnace. A question had been raised about lime, and he must say that up to lately he had always thought it was no good using lime. The general impression was that it did not pay for the trouble, and the little that was lost was very trifling. Some time ago, however, he fixed a tank about six feet in diameter, and 4 feet deep outside the works altogether, so arranged that he could draw the spent liquor from the boiler into it. He put a coil at the bottom of it, and churned the liquor with lime. This soon settled the question in his mind as to the value of using lime. Mr. Gandon some time ago said there was no question about its being of no use, and others said the same; but by the means he had described he obtained very fine salt indeed.

Mr. Valon said he had listened with great pleasure to the paper and discussion. As far as the cost of manufacturing was concerned, his results agreed as nearly as possible with the figures Mr. Gandon had given; in fact he agreed with him in almost everything he had said, excepting in the quantity of salt he manufactured per ton of coal carbonized. He presumed at Sydenham they used Newcastle coal, the same as he (Mr. Valon) did; but he got about 24 lbs. to 25 lbs. of salt per ton. With regard to the question of getting rid of the noxious vapours, he used steam to drive off the ammoniacal vapours into the chimney, and he used the open system, mixing the acid in the proportion of two parts water to one part of 80 per cent. acid, and they put it all in at once. They then drove the fumes over until the liquor was saturated, then put it into a settling-tank, and then re-impelled it into the evaporator. To get rid of the fumes they put a check pipe into the furnace, which was charged on the top of the furnace immediately under the boiler—not in the furnace, but there were any clinkering or anything of that kind the fumes would come out and choke the men. He had tried in every way to find, either close to the works or at a distance, anything of a noxious character, but had failed to do so. They did not suffer from any gas which fell down close to the works, but nothing more, and they had no complaint from their neighbours. He therefore had no reason to think that any other system would be better than the one he adopted.

Mr. BROADBERRY said he had compared his cost with the figures given by Mr. Gandon, and also on reading the account of the meeting of the Midland Association, he was much struck with the small quantity of the quantity of salt made. At his works they had made ammoniacal salt for many years. He found that his fuel cost about 8s. per ton of salt made, and the labour about 18s. per ton, whilst he made about 22 lbs. of sulphate per ton of coal carbonized. This included repairs and all, because the repairs were kept apart, and not mixed up with other labour. With regard to the use of lime, he had employed it, and found that he really obtained about 9 per cent. more salt in consequence. He did not always use it, however, because in changing men they sometimes found a difficulty in getting them into the system, and when a fresh man was put on they did not use the lime until he was acquainted with it again to the advantage of applying heat direct or by steam, he applied direct heat for about 15 months, but had to alter it to steam—not a coil, but a perforated pipe which ran along the bottom of the boiler from which he blew the steam through it. He thought this was more effective than a coil. He had to do this because when the men began to blow the steam through the boiler were applied direct, it sometimes came off more quickly than it could be dealt with, and by this means they found they lost a large quantity of ammonia, not using a check tank. By using a check tank perhaps the difficulty might be overcome, he, however, still thought the steam was preferable, because the evolution of ammonia could be regulated much better by its means.

Mr. Valon said he had tried lime to commence with, and found it rather a dirty process and a great nuisance, and he had since tried to do away with it in the following way. They took the spent liquor, and ran it out into a tank and cooled it, and then ran the water over it, and added it over and over again. Of course it decreased, and they had to add pure water to the scrubber, but the spent liquor was passed into the first washer.

Mr. GANDON said he was doing the same thing with his waste liquor to a great extent, although he did lime a portion of it.

Mr. ELDRIDGE said he had tried this plan, but found it impossible to get rid of the liquor.

Mr. Valon said he could not understand this, because every time the liquor ran through the boiler the bottom was reduced in quantity, and therefore he could not see why they could not get rid of it.

Mr. E. PRICE (Hampton) said he had carried out this plan with success for about nine years, running the liquor back again after extracting all the ammonia, and therefore he did not trouble about the fixed ammonia. He took the back into the tanks, and was worked over again. The question of nuisance was a most important one to consider. They had all been troubled more or less with this matter in the manufacture of sulphate; at all events, he had, and had tried various plans to get rid of it. He first tried condensing the fumes, but without success; then he tried running the fumes into the flue of the re-forest-stick, and carrying them up into a shaft about 120 feet high; but then he found that complaints were made, about a mile from the works, that the gases fell near the Hampton Court Palace, and therefore he had to abandon the system. Then he tried another plan, by running it direct into the front of the boiler, so that it travelled along the flues; but this was very destructive to the re-forest-stick, and he was obliged to abandon that also. Then he tried another plan of burning them under the boiler. He had at the present time an egg-ended boiler, and he ran the fumes into the side of the furnace directly over the fire, and they found it to be successful; but before they came into the furnace he had a closed system of exhausters between the saturator there was a catch cistern, so that all the fumes went over into this catch tank, and then there was another outlet from it which took away the steam, so that the liquor or the water ran away from this middle or catch tank, and then ran round the side tanks. Then he had also another one outside the works under ground—a little tank which also caught the liquor that might travel along from the tank outside. Since he had adopted this system he had never had the slightest trouble or complaint from any one. A great deal of the success, however, depended on having a good draught in the furnace, and unless there was a good draught the fumes would not burn away. He had just erected a new Cornish boiler, with which he could obtain any amount of draught, and he did not find the slightest difficulty in consuming the fumes.

Mr. ELDRIDGE said there was this advantage about the lime, in using it and putting the spent liquor into the lime tank, and passing steam through it, the water in the tank was made fit for use, so that if it was necessary to throw it over hot coke, or, as some of his friends did, send it to the Atlantic and other places, there was no annoyance caused; in fact, the water when it ran out of the tank might be thrown anywhere, and this was an additional advantage from the use of lime, besides the saving of salt.

Mr. MARSHALL said, with regard to the decomposition of the fixed salts of ammonia—viz., the carbonate and sulphide—doubt existed whether the mere action of steam would effect the entire decomposition of the salts;

but from various experiments he had carried out he was induced to think that the decomposition was not complete, as the following analyses would show:—

NH ₃ .		CO ₂ .		H ₂ S.	
Cubic Inches per Gallon.		Cubic Inches per Gallon.		Cubic Inches per Gallon.	
Before Heating.	After Heating to 200° Fahr.	Before Heating.	After Heating to 200° Fahr.	Before Heating.	After Heating to 200° Fahr.
9894	5635	3836	615	2118	1275

The samples of liquor were heated to 200° Fahr., and the carbonic acid, sulphuretted hydrogen, and ammonia were estimated before and after heating. After heating, both the two former existed in the combined state—viz., as carbonate and sulphide of ammonium; clearly pointing to the fact that the reaction was not complete, and that those who were content to simply heat their liquor, and neglected to use lime, must suffer a considerable loss of ammonia, to say nothing of that which existed as cyanides.

Mr. J. HAMMOND (Lewes) said the vital question in the paper appeared to be whether it was better to sell the liquor than work it up into sulphate. He thought they ought as managers to make the most of the ammonia before disposing of it, either as residual liquor or as sulphate of ammonium, and he thought this best utilizing it for purification purposes. He had a little apparatus which he used in this way: A small pump was at work continually night and day drawing say 50 gallons of crude ammoniacal liquor per hour from the ordinary rat and liquor well. The liquor was forced through the apparatus until the liquor before the scrubber and washer. Steam was not brought into direct contact with the liquor, but the plant was so arranged that he used a very small amount of steam to drive off almost the whole of the sulphuretted hydrogen and the carbonic acid from the liquor. These gases carried off also a small quantity of ammonia, which became converted to sulphate in the saturator, while the hot liquor ammonia flowed through the apparatus, heating in its course the ascending crude liquor, and flowing out cold to the scrubber and washer for the purification of the gas. So that he needed no Coffey still, no boiler set over a fire, nor did he need a steam-pipe leading into a large boiler with a great bulk of ammoniacal liquor under treatment, and the time in order to make a small quantity of sulphate. He continually pumping a small stream of liquor through the apparatus and driving off by steam-heat the impurities, combined with a small quantity of ammonia, through acid, he could produce good sulphate, and at the same time greatly assist in the purification of the gas with the purified liquor. To dispose of the surplus liquor, he was provided with a small tank, the bottom of which the purified liquor while hot. This was arranged at a certain height, and the liquor flowed in a regulated quantity into small vessels for treatment with lime and high-pressure steam, thus producing strong ammoniacal vapour and liquid ammonia, which could be led up to assist in a further purification of the acid in the saturator, and in the sulphate making. He therefore had two distinct processes at work in dealing with the ammoniacal liquor, and he found it best, because by dealing with it in this way, he did not increase but rather decreased the quantity of liquor remaining to be treated with lime. He had been working at this manner for some years, and was so pleased with the results, that he hoped at some future day to bring the matter before the Association in the form of another paper; but having been in some confusion for the past two years with necessary extensions and alterations of gas-works plant, he had not been able to fulfil the promise which he made when he read the former paper. It was certainly clear to him that there was a very easy way in which they could make use of ammoniacal liquor over and over again for the purpose of purifying gas, and at the same time convert only the surplus liquor into sulphate of ammonia. He had never any very strong carbonate or sulphide liquor in his works. The only treatment with treatment with steam kept the liquor low as 2° Twaddell, but it really contained 13 ounces or more of ammonia per gallon, which made it so valuable as a purifying agent; and the small but continuous quantity under treatment at one time prevented any danger or nuisance from excess of foul gases. If they could combine the process into one, instead of making two, and purifying the gas, and the purification of the liquor, he thought it would be far more profitable, and better than sending the crude liquor off the works as soon as made.

Mr. MARSHALL said, with regard to the sulphate made per ton of coals, this seemed to vary greatly with different makers. Mr. Goddard had, he believed, stated that he obtained 24 lbs. of sulphate (of 25 per cent. quality) per ton of coals. This was a very good working. They had heard statements of results approaching 34 lbs. of sulphate per ton of coals, but this would probably be accounted for by the makers using inland coal very rich in nitrogen. The practical results obtained by makers who used Newcastle coals, and who made 30 gallons per ton of 8-oz. liquor by the "acid" test, equal to 9-oz. liquor by the "distillation" test (this showing the total amount of ammonia available), was, he believed, about 23 lbs. of sulphate per ton, and this would be theoretically correct, for assuming that 1 ton of coal produced 30 gallons of 8-oz. acid liquor, or 9-oz. distillation liquor, 100 tons would produce 3000 gallons of 8-oz. liquor, but he would produce theoretically 3237 lbs. of sulphate per ton. Taking as a basis 1 oz. of strong acid to equal 0.347 oz. of ammonia, then by taking the "distillation" ounce strength, say 9 oz., and multiplying by 0.841 = 7.569, divided by 10 = 0.7569 lb. of sulphate per gallon, or 2387 lbs. of sulphate per ton of coal.

Mr. JOHN CHAPMAN said he was glad to find that though Mr. Goddard had stated that small works could not set up valuable machinery for making sulphate, still he gave some hope to those who were engaged in small works that they could make something out of their liquor by taking care.

Mr. T. MAY (Canterbury) said he had manufactured sulphate of ammonia with a good deal of success, and with no nuisance. His was the close process, and the noxious gases from the saturator were taken to the boiler, the flue of which was connected with the chimney-shaft. No nuisance had arisen, nor had they had any complaints for years, though last year they manufactured 84 tons of sulphate. The apparatus was economically manufactured on the works, and cost £150, including the boiler, saturator, depositing tank, evaporator, and drainer, and also all the pipes and setting the brickwork. The saturator was entirely of lead, set above and circular. The sulphate made was white and crystalline, and he produced 22 lbs. per ton of coal carbonized. The cost, including fuel, labour, and packing, was 20s. per ton. This did not include any repairs, because there had been none since the apparatus was set up.

GODDARD, in reply to Mr. Marshall, as to getting rid of the nuisance, said his own experience was that there need be no nuisance. They ought properly to condense the sulphuretted hydrogen and carbonic acid gas through a water condenser such as he had described, and then carry the fumes to the fire of a Cornish boiler, not below the fire-bars, but above

vious day, if punctuality was observed at the above hour, and the clock is inspected, say, at nine, it will be found that it has gone three hours; if it is opened at half-past six o'clock, it will only have gone $2\frac{1}{2}$ hours, and so on.

Another purpose to which it might be readily applied would be the supplying of one, two, or any stated number of automatic governor burners for market-stands, itinerant hawkers, &c. The clock would be so constructed that it might not be convenient to place meters. The number of hours the clock indicated, multiplied by the number of feet the burners were adjusted to, would give the consumption. The chief interest for ourselves, however, is its adaptation to public lamps, but I have made these suggestions as they may be cases where the clock arrangement would be useful for such purposes.

Discussion.

The President said Mr. Peebles's paper was one of great interest, because a gas manager ought, at the end of the financial year, to be in a position to show the loss by leakage or unaccounted-for gas. If the lamps were adjusted with the apparatus described, one obstacle to correct calculation would be got rid of. It could be ascertained exactly how much gas had been consumed in the public lamps. He was certain that if this apparatus were adopted, satisfactory results would ensue, as he thought that a certain quantity of the gas which was accredited to leakage was not the result of leakage at all, but gas consumed in the public lamps, which had not been accounted for. He had had conversations on this subject with several managers, and the lighting of public lamps seemed generally to be considered a grievance. The average meter system, too, did not afford satisfaction in every quarter.

Mr. D. M. NIELSEN said it seemed to him that if lamps over a specified district were supplied with a regulator tap, the quantity of gas consumed by them would be indicated by one of the tell-tale clocks described, because it would indicate the quantity of gas which each had consumed. He knew a corporation which had had great trouble with the average meter system, and he thought of installing one of the tell-tale clocks of one size. This invention of Mr. Peebles would remove such difficulty.

Mr. D. M. NIELSEN said he had heard of this apparatus before, and had doubts about it, but the explanations afforded by Mr. Peebles removed them. He thought Mr. Peebles had taken the most common-sense view of the matter (Mr. Nielsen was the average meter system), and he had great hope that the appliance described would be shortly introduced into towns.

The President having proposed a hearty vote of thanks to Mr. Peebles for his paper,

Mr. PEEBLES said: I beg to thank the meeting for the vote which it has been so kind as to accord to me. As I have said before, it gives me great pleasure to exhibit any novelty to the members of the Association, in whose periodical meetings I have always taken a great interest, and I hope shall continue so to do.

Mr. NIELSEN: The very fact that so few remarks have followed the reading of the paper is the best argument that I know in favour of the instrument.

Mr. S. DALZIEL (Kilmarnock) then read the following paper:—

ON THE TREATMENT OF RESIDUALS.

(FIRST PAPER.)

Our worthy Secretary has put me down for a paper on residuals. I hope that he meant to imply that the hopes and expectations are limited to the by-products tar and ammoniacal liquor.

I doubt not it is in the recollection of some of the older members of this Association that, in the earlier days of gas-making, these articles were a heavy drawback or drag in the conduct of gas-works. There was no market for them, and they were an important source of expense; in some cases, during the last four years, being equal from 5s. to 5s. 3d. per ton of coal carbonized. I believe that, notwithstanding the grand discoveries which science has made, by the researches into the constitution of coal tar and its many components, better days are in store, and better prices still will be obtained for them. I have no doubt that in the purification and sale department to which gas shareholders will look for a fair, if not a good return for the money invested. In giving a receipt for the making of hare soup, Mrs. Glasse says the first thing is to catch your hare. Now, in many of our gas-works we have allowed the "hare" to slip through our hands, and to our own great loss. It is the author of expense and waste, not to mention the intolerable stench that arises when a purifier is changed in works where no scrubber or washer is used.

In 1872, when I was appointed Manager, the time had come in which it was absolutely necessary that large extensions of the works should be made. The wave of prosperity that swept across the land in 1873 had begun to rise, and I may say I was caught between two Boards—the Board of Directors of the Company, and the Committee of the Corporation. The season was well advanced, and there was no time to plan, renew, or alter any part of the works. I was, therefore, obliged to select the best plant to the best of my ability, in order to get through the first winter; and here I may state that that winter I gained experience which only falls to man's lot once in his lifetime, and only to those similarly circumstanced myself. At the end of my first year I found that in some things I was not so well equipped as I expected, and was considerably disappointed. I cannot say at this time whether it was in the return per ton of coal or a fall in the prices of residuals, but I was chagrined to find myself in the back-ground with regard to this difficult point. In the first year of my working I only made 16 lbs. 33 oz. of saleable ammonia per ton of coal.

At this time I had one scrubber 20 feet high and 4 feet 3 inches wide, and had become satisfied that an additional one would be an advantage. Accordingly, in the winter of 1873-4, when I enlarged my purifiers, I added an additional scrubber, with the result that, although not finished till the new year, at the end of the season I found the amount of saleable ammonia had increased 24 lbs. per ton of coal carbonized, although the best part of the season was past before the scrubber was put into operation. In the following year (1874-5) I derived the full benefit from this addition, by making 34 lbs. of saleable ammonia per ton of coal. You will observe that the additional scrubber gave me 5 lbs. of sulphate of ammonia per ton of coal more in the year 1875 than in 1873.

During the winter of 1874-5 I was very much tantalized by finding that my first scrubber was not behaving in the manner a good scrubber ought to do. I found that it was not doing its duty in getting a goodly portion of tar and the lighter oils, the condensers apparently having done off or shirked their duty on finding themselves overworked, and had apportioned a part of their work to scrubber No. 1, with the effect that although scrubber No. 2 was always up to the mark, when I passed the water to No. 2 into No. 1, I could not get No. 1 to increase more than a

degree in strength, although it had the first of the gas; thus convincing me that, from the fatty nature of the water, the condensers had not cooling surface enough to perform the work required of them. Not follows will at least show essential it is that every piece of apparatus, in a gas-works at show, should be quite equal to, and more than sufficient for the work required of it. In the autumn of 1875 I doubled my condensing power, so that at the end of the season I had secured 110 more of good saleable sulphate of ammonia 24 lbs. per ton of coal, the sale for the year being 49 tons 12 cwt. from 4534 tons of coal carbonized; and from that time to the present—that is, for the past four years—my make of sulphate has ranged from 264 lbs. to 37 lbs. 3 oz. solid per ton of coal.

Now, I cannot but be satisfied that the fact that the manufacture of gas begins in the retort and ends in the hydraulic. In addition to this I would say that our by-products are also made there, and are influenced very materially by the heat at which the coals are carbonized in the retorts, and I am inclined to hold the opinion that if the heats in our retorts are raised, the by-products will be increased, and thus increase the illuminating power of the gas. I grant that a larger volume of gas is made per ton of coal, but it is at the expense of the tar, and also of the ammoniacal liquor, which I consider is deteriorated in quality, the tendency being to convert ammonia into cyanogen gas. At the same time I have to say that the heats of the retorts may be, but every manager of one in particular which is managed by one of the cleverest men in the profession, and stands high in general working, and I found that though I had not sold nearly so much gas per ton of coal, the income from by-products fully met, and a little more, the difference, that is, valuing the power of thousands of feet of gas sold per ton, will be income for the by-products, when I summed up the gains from both together, comparing the value of the coals, the gain was on my side; but possibly, if full details could have been obtained, it might not have resulted so favourably for me. In works where the by-products are worked up, it is not so much the heat of the retorts as the heat of the washers, and the manager should do his best for both departments; and then he has his satisfaction, that should anything be lost in the retort-house, it is recovered in the chemical works.

I must, however, not be misunderstood, for, as managers of gas-works, our primary duty is in manufacturing gas—got as much as we can of it per ton of coal, and of such a quality as will satisfy even the most fastidious consumers. After we have made the gas in the retorts, and it has taken its first plunge bath into the hydraulic main, purification begins; the gas begins to part with its tar and liquor. Pushing on to the condenser, this power is further increased, and the gas is sold per ton, will be income for the condensers, I always have in addition to tar and water a large deposit of carbonate of ammonia, so much so that in mid-winter I have to wash the condensers with warm water sometimes twice a week, to prevent choking; in fact, I have to watch them daily to keep things moving right, and I am considering whether it would not be better to have a scrubber, which steam entering with the gas into the condenser, to supply moisture to prevent the carbonate of ammonia from crystallizing. Presuming that the condensers are doing their duty, and the gas reaches the scrubber free from tar, the gas is just in the condition in which scrubbing is effected at the moment it enters the scrubber, and the attraction power of the ammonia being so great that it instantly seizes and holds it in solution; it is what the German, in describing "likings and dislikings," calls "*Lust und Unlust*," the attraction for each other being so great that they go together with a rush. Water at 60° will take up as much as 500 times its weight of ammonia, and the gas will take up 500 gallons of ammonia. So here is an agent that costs nothing, which was once thrown away, a willing servant ready to assist us in the work of purification, and adding considerably to our revenue. The mixture of water and ammonia is not a new chemical compound, neither is it chemically stable; it is a mechanical attraction, the one law for the one, and the other for the water the more ammonia will it hold in solution; thus in winter, when it is most needful, the scrubbers are in the best condition to perform their work. At this point not only is ammonia taken up, but also, it is said, carbonic acid, hydrosulphuric acid, hydrocyanic acid, and phosphoric acid, and in addition to these, a small quantity of chlorine gas, and hydrochloric acid. These water takes up readily, and this accounts for the fact that the liquor of our gas-works is denser than pure ammonia water. Supposing water to be 1000, a solution of strong ammoniacal liquor is about 870, whereas gas-works liquor at 5° is only 845. The denser the liquor, the more ammonia it will hold in solution, and the more it will not always to its commercial value; still, in my own working, I have found that when proper attention has been given to the stills, &c., the results have always been in proportion to the strength of the liquor.

I have two scrubbers, which I will call No. 1 and No. 2. No. 1 being the first, No. 2 the second to which the gas passes. No. 2 I will fill up with clean water, and when it has become saturated up to 3° or 3½° Twaddell, I run off No. 1, which by this time has gone up to 7° or 8° at the most—that is, 14 to 16 oz. liquor—and the weak liquor of No. 2 I run into No. 1, and refill No. 2 with clean water again, so that the gas has nearly always fresh water to scrub with. I have found that water at 60° will take up 500 gallons of ammonia, and as low as 24°, or 5 oz. liquor; and the average, when the liquor of No. 1 scrubber is run off, brings it up to 5° and 5½°; that is, that the specific gravity of the liquor which I fill into my boiler is from 1025 to 1030, and on a rare occasion it rose to 1036. This has occurred very close to the strength of the liquor in green tar, and is from 7° to 8° Twaddell. The crystals of ammonia are dissolved, and run on to the tar-well, the liquor on these occasions sometimes ranging over 6° Twaddell. There is another source of very strong liquor—namely, from the tar still. One would be disposed to think that, from the nature of green tar, and the strength of it, it would be very difficult to get a strong liquor, but in fact it is; but in a boiling of green tar of say 2400 gallons, I get from 90 to 100 gallons of naphtha, about 400 gallons of ammoniacal liquor, and 1900 gallons of boiled tar. This liquor that separates from the tar at the beginning of the distillation is as high as 10° Twaddell, and coming down the side of the still, the average strength of the liquor in green tar is from 7° to 8° Twaddell, or 14 to 16 oz. liquor. The density of the liquor is the cause why it does not separate from the green tar, the specific gravity of liquor being so near to it that it is not light enough to come to the top surface of the tar. Green tar, therefore, is valuable not only for itself, but for the strong liquor which it holds in suspension, and which is returned during the distillation of the green tar to the tar-well.

What I have been saying has been chiefly in regard to the ammoniacal liquor. In reference to tar, in order to cleanse the gas from this substance, condensation on its way to the retort is necessary, and the gas, having been cleansed or purified from tar, the operations of the scrubbers and the purifiers also were more active, and did better the work that was assigned to them. Hence, as I have already remarked, the necessity of having all our apparatus quite, and even more than equal to the work required of them, otherwise it

there is a lack of condensing power, there is a loss of a return for tar, also for ammonia. If the scrubber has to do the work of a condenser, then the purifiers have more to do, so that more lime is used than would be needful if all the apparatus were up to the point in size, and doing their work efficiently. This is a matter which all managers should try to improve upon directors of companies and committees of corporations—viz., that judicious expenditure on plant always meets a sure reward in the shape of 10 per cent. dividends on the capital employed. The liberal man deviseth liberal things. It is a great fallacy and false economy that attempts a manner in any portion of his plant. In reference to this particular article ammonia, each portion paid itself in the first eighteen months; and I would advise all managers situated as I was myself to induce their directors to put their hands into their pocket and enlarge their condensers, or put down an additional scrubber. The increased dividend jingling in their ears at the end of the first year would, I hope, enlarge their hearts, and cause them to let the manager also, who has the oversight of these matters, share in their prosperity.

Discussion.

The President said he should like to know from Mr. Dalziel whether it would be profitable for small gas-works to utilize their own residual products, and what additional capital would be necessary to enable them to do so. If this point were made clear, he had no doubt that many corporations and gas companies would begin at once to work up residuals. Every one was aware that a large sum was annually expended for these residuals in the shape of carriage alone; and if it paid others to do this—he did not think there could be any doubt on this point—he did not see how it should be a disadvantage to the company. The only question with him was what annual make of gas would be necessary to render such works profitable.

Mr. NIVEN considered that the chemistry of the residuals had been exceedingly well brought out in the paper. In regard to the commercial question raised by the President, it was the duty of each one to decide for himself. He understood that the paper was only preparatory to another, in which he had no doubt Mr. Dalziel would give all particulars from a commercial point of view. He would, therefore, not anticipate these particulars by asking questions.

Mr. DALZIEL, when asked, thinking he wished to bring under the notice of the meeting—namely, that some gas-works had not the necessary power to propel machinery; but now that gas-engines were so handy he should say that every manager ought to have a scrubber. He was certain if those who had not such mechanical power would only introduce a gas-engine, they would nearly double the rate of ammoniacal liquor. Here alone there was a large return from a substance which ought to be taken out of the gas before it went to the purifiers. He stated that he meant to give a paper on this subject—bringing out further details—at the next meeting.

Mr. M'GLUCHIE briefly explained a new photometer dial of his arrangement, to simplify the testing of gas.

Mr. MITCHELL then moved a vote of thanks to Mr. Carlow for the way in which he had discharged his duties as President. No exertion had, he said, been wanting on Mr. Carlow's part to make the meeting attractive and instructive.

The President, in acknowledging the compliment, said if he had done enough to further the interests of the Association, he had his recompense in seeing so many kind faces around him that day. He concluded by moving a vote of thanks to the Secretary, Mr. Johnstone, for the way in which he had discharged the duties of his office.

Votes of thanks were also accorded to the authors of the papers, and to the friends of the Association who sent articles for exhibition.

On the motion of Mr. NIVEN, seconded by Mr. RENNIE, it was agreed to hold the next meeting of the Association in Glasgow.

Mr. MITCHELL moved a vote of thanks to the Magistrates of Port-Glasgow for the use of the hall in which the meeting had been held; and this was agreed to.

The President said he had a letter from Mr. Levi Monk, of Lanark, in which that gentleman wished the members of the Association a long farewell. Mr. Monk stated that he was sorry he could not attend the meeting. He (the President) might say that Mr. Monk had been a very valued member of the Association, and he thought that the least they could do would be to wish him prosperity, comfort, and happiness in his new sphere.

Mr. NELSON asked whether the statistical report of the Association was to be continued.

The President said that this matter had been once or twice under the consideration of the Committee, and it came to be a question whether the report should be issued yearly, or once every two years. Last year it was not issued till November or December, and by that time this year the Committee would be able to decide whether it should appear.

In the course of the day the members of the Association visited the Port-Glasgow Gas-Works, and were shown over the premises by the President. Through the kindness of Provost Somerville they were entertained to lunch at which several very appropriate toasts were given. In the afternoon, at the conclusion of the business, the members dined together. Mr. Carlow in the chair, and Mr. Dalziel discharging the duties of croupier. A happy evening was spent.

DRY WEATHER ACROSS THE ATLANTIC.

(FROM OUR AMERICAN CORRESPONDENT.)

The summer just ended has been one of unusual dryness in America, and the fall has failed to bring the hoped-for relief. All through the summer the water companies throughout the eastern and middle portion of the United States, and especially the latter, have been living, so to speak, from hand to mouth. The companies and corporations which draw their supply from various sources, and have large storage capacity have had, comparatively, little fear, estimating that they could pull through till the autumn rains made the streams flow with their accustomed fullness; while the purveyors of water who have only one or two means of obtaining a supply, and possessing moreover but a scanty reserve, have resorted to various expedients to obtain a temporary supply, feeling confident that the fall would bring the desired relief. Unfortunately the transition from summer to autumn has brought little change—a dry summer is apparently to be followed by a dry fall. The state of affairs in many cities is thus very serious.

In Brooklyn, N.Y., the authorities are sinking a number of large wells, which it is hoped will so increase the present supply as to meet the want of the city. In the meantime, much inconvenience and loss are experienced, the quantity of water sent out not being equal to the demand. Paterson, N.J., is suffering greatly from the drought. The Water Company of that city obtain their supply from the Passaic River, which is controlled at this point by the "Society for the Promotion of Useful Manufactures"—a Society founded by Alexander Hamilton, and whose charter gives them the exclusive use of the Passaic River above the Falls. Consequently the river is lined with factories of all descriptions, which

utilize the swift-flowing current to produce their motive power. As in some dry seasons the supply of water failed them, a dam was built above the race-way, so that the Society might have at all times an abundant reserve at their disposal. When the water-works were built the Company was assured the local authorities, and the directors of their gas works, that what flowed over the dam. The drought has dried up the Passaic River, so the Society have been compelled to draw from their reserve; and, no rain coming, this surplus has become so far exhausted that the factories have had to work only half time. Some, however, have closed "for want of water," as the signs on the doors state. The Water Company having their reserve reservoir only part full, determined to keep the water for use in case of fire. Thus the supply to the town has been entirely cut off, necessitating the close of nearly all the factories throughout the city, and the labourers thrown out of employment peddle water to the citizens at a price of a gallon for a dollar. The cutting of the water from considerable distances. A slight rain on Oct. 7 gave temporary relief, but the aspect of affairs is serious, especially as many other cities get their water from the Passaic below Paterson.

The effects of the drought in these cities are not exceptional cases, but examples of many others. Even in New York City, with its many sources of supply, the Commissioner of Public Works issued an order on Oct. 18, prohibiting the use of water for sprinkling the streets.

AMERICAN GASLIGHT ASSOCIATION.

[From the "Official Report" in the American Gaslight Journal.]

The Eighteenth Annual Meeting of this Association was held at Chicago, Ill., on Wednesday, Thursday, and Friday, the 13th, 14th, and 15th ult. Mr. J. H. Furzer, of Cleveland, Ohio, was the President, in the chair.

The minutes of the previous meeting, having been taken as read, the names of thirteen applicants for membership were read; and, on ballot, the whole of them were elected.

THE PRESIDENT'S ADDRESS.

The President, in the course of his opening address, said: "The year that has passed since our last annual meeting has not, so far as I am aware, witnessed any remarkable changes in the condition of the gas-lighting industry in either our own country or in foreign lands. There has been, however, a steady—in some instances a large decline in the price of gas, and an equally steady advance in measures demanded to meet the new conditions."

Referring to the first point, I have been for some time a believer in the doctrine, that our companies should make their money—as all large manufacturing industries in the long run make theirs—by large sales at a small percentage of profit. Gas is a comfort, a luxury, which we should aim to bring as nearly as possible within the reach of all. In this matter our interest is in the same direction with an enlightened public spirit. Our only real competitor is petroleum, and that, at the low price prevailing for the last few years, and by the use of improved lamps, is a real competitor. Yet in our larger towns, where a liberal consumption may be secured, if the gas-works are in the best condition, if labour be judiciously applied, if good material be used, if the expense of distributing be kept at a low level, and if stock-works are so arranged as to be able to sell at a genuine unwavering stock, gas may be sold at a price which will make the margin of cost between good gas light and poor oil light very narrow.

With your leave, I will indicate some lines in which a steady advance in the right direction has been made during the past year.

It is obvious that manufacturers of gas-works must, ere long, adopt improved furnaces. The old furnaces, in which 40 to 50 per cent. of the coke produced is consumed in carbonizing, must be discarded, and some form of the many now claiming attention must take their place. If there be a furnace, as I am confident there is, which will require not more than 25 per cent. perhaps not more than 15 per cent. of the coke made, which will require much less labour in firing and clinkering, before which the labourer can work in comparative comfort, and, above all, which will much more effectually heat the bench, making every retort equally well from end to end, that furnace must be adopted. I do not undertake to say that such a furnace is at present in existence, but I am confident the best must be searched out and must be introduced, and the discussions of the past year have helped a good deal in this direction.

One reason why gas can be sold so very low in the Old World, especially in the British Isles, is the fact that the saving and utilizing of residual products, which is now carried to a large extent, is not so much the case of these residual products is ammonia. In this country that product has been, and is now largely wasted. But it is a valuable product. In order to secure a successful working of the ammoniacal liquor produced in your works, you must have such scrubbing apparatus that you can take from your gas, not only all the ammonia, and the gas must be concentrated in form. Some remarks do this, and some do not. The truth is, that the best scrubber has been slowly evolving for some years, and this matter has made considerable progress during the past year.

I think I am correct in saying that 15 years ago most gas works were content with a product of from 4.25 to 4.50 cubic feet per lb. of coal carbonized, and as a matter of fact the former figure was more generally the limit than the latter. Now our average of 5 feet is not considered extraordinary, and a few obtain a much larger product than this. I have lately visited a works in which I was assured that more than an average of 6 feet was obtained, and I was credulous enough to believe the statement.

However this may be, it is well settled that more and more may be made from every lb. of good coal carbonized in your works. Time, quantity, heats, and enricher—all these items must be considered and adjusted in determining the best process for obtaining the largest yield of good gas. Poor quality will not be tolerated. The past year has contributed something towards a solution of the question: What is the best system of carbonizing?

A year ago I ventured to call your attention to machinery invented by Mr. Ross, and in use in the works of the Cincinnati Gaslight and Coke Company, and I beg leave to again call your attention to that machinery. I have not altered my confidence in it, and I understand that more and more men than I am have endorsed it, and that it is likely to have a thorough trial in one of the largest works in America. I only ask you to examine it for yourselves. If the machinery is a success, the inventor has conferred a great benefit upon the gas fraternity.

Some of our domestic coal-burners are now injudiciously and more wastefully used than that which you furnish, and no department of effort deserves more attention than this—the introduction of the best burners, and in our streets the best lanterns. You may visit the house of one neighbour, and you will find the most perfect illumination; and you will visit another, and you will find a dark and uncleanly room, and yet perhaps the latter is consuming more gas than the former. The difference may be wholly caused by the burners employed. During the past few years, and especially the one just passed, much has been written and much has been done to remedy this difficulty. And this remark will apply to street lighting as well as to domestic lighting. It is a matter of great importance, and the selection of the proper lantern is left to some chairman or some committee stupidly ignorant or indifferent. Sometimes the coaxing blandishments or the insinuating bribe of some scheming manufacturer of

a "new and improved lantern" wins the day, and the wayward pedestrian carries good gas and denounces it as poor, when the whole difficulty lies in the burner used for its combustion, or the instrument used for its protection and diffusion, or both.

Probably greater advance has been made during the last year in promoting the use of gas in the kitchen, the laundry, and the engine-room, than in any preceding year. I think this must be certainly true in our own country. In towns where gas is sold at a low rate, a great many cooking and laundry stoves have been placed, and usually with much satisfaction to the parties using them. This good work will go forward. So also the introduction of gas-engines for many purposes is making rapid advance, and will progress more rapidly in the future. The importance of promoting these various forms of day consumption is obvious to every gasman, and I need not dilate upon it here.

Thus, gentlemen, I have hurriedly referred to the march of improvement in your department of labour, as it appears from my standpoint. There might be much said upon many points of interest, as, for example, water works, electric lighting, &c.; but these introductory remarks have already been extended quite far enough—perhaps too far, for I am sensible that I have said nothing new. It is now for you, gentlemen, to make this convocation eminently profitable and interesting.

The Report of the Executive Committee was then read. It detailed the titles of the papers to be read at the meeting; and recommended, among other things: That the proposal to change the time of the annual meeting from October to May should be considered; that a Committee should be appointed "to prepare a table of standards for the use of the Association, to the end that all papers presented, and discussions had on such papers, may be based upon a common standard of results and comparisons;" and that the salary of the Secretary and Treasurer of the Association should be fixed at 300 dols. per annum, with an allowance not exceeding 100 dols. for expenses during attendance at meetings.

The Treasurer's report, which was also submitted, showed that the receipts during the past year (including the balance in hand at October, 1879) amounted to 2196 dols. 35 cents. The disbursements totaled to 1059 dols. 81 cents; increasing the balance in hand to 1136 dols. 54 cents.

The Committee on Standards, consisting of Mr. C. Nettleton, Major Dresser, and Mr. Sherman—and the Committee on Unaccounted-for Gas—composed of Mr. A. C. Wood and Mr. C. A. White—were not prepared with definite reports, and so were re-appointed for another year.

After the transaction of some routine business in connection with the affairs of the Association, the report of the Executive Committee mentioned above came up for consideration. The proposal to alter the time of meeting from October to May was, after much discussion, adjourned till the following day, so as to allow the members time to talk the matter over among themselves. The other two recommendations of the Committee, referred to, were adopted.

The adjournment for luncheon then took place; and on the re-assembling of the members, the following list was read of

OFFICE BEARERS FOR 1880-81.

President—Mr. W. H. Price.

Vice-Presidents—Messrs. A. Hickson, P. T. Forsall, and W. A. Stedman.

Secretary and Treasurer—Mr. W. H. White.

Finance Committee—Messrs. J. S. Chambers, A. B. Slater, and G. S. Hooley.

Executive Committee—Messrs. H. Cartwright, F. C. Sherman, A. C. Wood, P. T. Durtis, T. Littlehales, and S. Frohitt.

The heading of papers was then commenced.

(To be continued.)

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following table in reference to the Water Supply of London during October. According to returns furnished to him by the Metropolitan Water Companies, 140,951,821 gallons, or 640,454 cubic metres of water (equal to about as many tons by weight) were by night supplied daily, or 236 gallons (107·2 decalitres), rather more than a ton by weight, or 33·2 gallons (14·5 decalitres), rather more than a ton by weight, or 33·2 gallons during October, 1879.

COMPANIES.	Number of Houses, &c., supplied in		Aver. Daily Supply of Water in Gallons* during	
	Oct. 1879.	Oct. 1880.	Oct. 1879.	Oct. 1880.
Total supply	571,608	597,353	131,865,536	140,951,821
From Thames	273,473	286,548	68,579,547	71,284,299
" Lea and other Sources . .	298,135	310,805	65,989,009	69,677,522
THAMES.				
Chelsea	29,945	30,375	8,424,200	8,645,700
West Middlesex	53,312	55,846	10,316,367	10,811,269
Southwark and Vauxhall . .	88,099	91,942	24,469,042	24,487,126
Grainchurch	8,800	9,000	2,799,418	12,376,304
Lambeth	62,469	65,557	13,876,590	14,361,700
LEA AND OTHER SOURCES.				
New River	139,371	132,019	28,113,000	26,733,000
East London	120,459	128,015	29,843,000	34,621,000
Kent	48,495	50,771	8,024,009	8,920,322

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for October, 1880, as compared with that for the corresponding month of 1879, shows an increase of 29,745 houses, and of 6,693,265 gallons of water supplied daily.

The following is Dr. Frankland's report of his analyses of the water supplied to London during October:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water amounting to the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Colne Valley, 1·3; Kent, 1·6; Tottenham, 1·7; New River, 4·6; Chelsea, 5·3; East London, 6·2; Grand Junction, 6·6; Lambeth, 7·3; Southwark, 7·3; West Middlesex, 8·1. The water drawn from the Thames was of inferior quality even to that supplied during the month of September, and, excepting that of the Chelsea Company, was unfit for domestic purposes. The water of the Grand Junction and Southwark Companies was more efficiently filtered. Of the water drawn from the Lea, that distributed by the Kent and East London Companies was slightly better than that from the Thames water. That distributed by the Tottenham Local Board was of slightly better quality than the Chelsea Company's water, and was efficiently filtered before delivery. The deep-well water supplied by the Kent and Colne Valley Companies and by the Tottenham Local Board of Health was of the usual excellent quality for domestic purposes, and the

Colne Valley Company's water was also soft, and therefore well suited for washing. Seen through a stratum two feet deep, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colorless; New River, clear and pale yellow; Southwark and Grand Junction, clear and yellow; Chelsea and East London, slightly turbid and pale yellow; West Middlesex and Lambeth, slightly turbid and yellow.

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Matter.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen as Nitrates and Nitrites.	Total combined Nitrogen.	Chlorine.	Total Hardness.
Inner Circle.								
Thames—								
Chelsea	29·45	·268	·042	0	·119	·191	1·5	20·6
West Middlesex	28·90	·417	·067	0	·162	·280	1·4	20·3
Southwark	32·10	·410	·066	·002	·182	·289	1·6	21·5
Grand Junction	30·73	·325	·062	0	·190	·323	1·3	21·2
Lambeth	31·81	·353	·040	0	·204	·244	1·5	21·5
Lea.								
New River	29·14	·227	·042	·001	·216	·259	1·6	21·8
East London	28·40	·236	·039	0	·135	·174	1·7	20·6
Deep wells—Kent . . .	42·92	·074	·019	0	·352	·371	2·5	27·8
Outer Circle.								
Colne Valley	13·36	·058	·019	·004	·334	·355	1·5	6·1
Tottenham Local Board .	40·36	·087	·013	·070	0	·073	2·9	25·7
Corporation of Birmingham.								
Corporation of Glasgow .	32·70	·340	·049	·002	·154	·204	1·5	22·7
Corporation of Glasgow .	2·80	·127	·013	0	·007	·020	0·58	0·95

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough. Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transposes the hardness in the table into degrees of hardness on Clark's scale.

ODESSA WATER-WORKS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Wednesday, at the Terminus Hotel, Cannon Street—Sir FRANCIS S. HEAD, Bart., in the chair.

The SECRETARY (Mr. Emanuel Allen) read the notice convening the meeting, and the Directors' report was taken as read. It stated, among other things, that the water-rents had yielded £23,673 for the half year ending the 30th of June last, as against £22,843 and £17,985 for the same periods respectively of 1879 and 1878; and there were a total net receipts of £25,002, for last half year, against £24,249 in the corresponding period of 1879. The expenditure at Odessa had been £10,992, and at London £1414, against £11,350 and £1977 respectively in the same half of 1879.

The CHAIRMAN, in moving the adoption of the report, said the causes of the apparent increase in the working expenses of the past half year, as compared with the corresponding period last year, were explained generally in the report. Having amplified these details, and accounted for £994 of the increase, he observed that a further sum of £781 had been spent in additional coal, caused by the larger supply of water required by the town. This water, however, was paid for, so the Company could not complain. The only item of increase was the law expenses, which amounted to £193 more than before. With regard to the severity of the winter at Odessa, which caused, as the report explained, so much of the increase in the working expenses, the Shareholders might judge how excessive it was when he stated that the frost reached services 4 feet under the ground, and several of them were frozen, and had to be closed for many weeks. The Chairman said he was very anxious to see many cases of frost in Odessa, but he had not seen for 30 years. The value of the rouble had somewhat improved, which gave the Company a better balance on the whole than they would otherwise have had; but he was sorry to say that this improvement had not continued. One of the points on which the Directors and the Shareholders were particularly anxious to see the Company allowed to vary their fares according to the fluctuation of the rouble, this Company was denied that privilege; and the consequence was that the rates were fixed for them when the rouble was worth its full value, 2s. 8d., were still maintained now that it was worth only 2s. He had mentioned on previous occasions the intention of the Directors to have the sewers being completed and connected with the houses, as each house would then require a considerable quantity of water to flush the drains; and this was also necessary for the health of the inhabitants. From the 24th of July to the 8th of October the average death-rate was 41 per 1000, and in August it was 55 per 1000. This very high death-rate was entirely owing to the want of sanitary arrangements, which should be carried out in the public interest, as well as in that of the Company. He was, however, happy to say that some progress was being made in the matter, although it was not so rapid as the Directors could wish. After quoting recent reports of the Manager, he intimated the progress that had been made in this matter, and the condition of the city he observed that the city itself was progressing steadily in size and importance, and the wants of the inhabitants were consequently becoming greater every year. The Company must hope to benefit—as, in fact, they did—from this improvement. On the 30th of June last the population were about 100,000, and the guaranteed amount; by the end of September they were only 5000 roubles under it; and this had since been converted into a surplus of 9000 roubles by the payment of an old account. The Company were, therefore, making as much progress as they could expect, under the circumstances in which they were placed, but, as he had repeatedly said, until they obtained an alteration in the law, they would not be able to look on any arrangement with the Municipality as quite out of the question. The Company's claim on the Imperial Government for 71,500 roubles for water supplied to the Imperial garrison at Odessa in the last 5½ years had not yet been met; but a fresh representation on the subject had been addressed to the Government, through the present Russian Ambassador, Prince Lobanoff, who was better acquainted than most Russians with the Company's affairs; and on Monday last he (the Chairman) received an answer to the effect that the Foreign Minister at St. Petersburg had communicated the matter to the War Minister, and that the reply of the latter was awaited. He had recently had some conversation with Lord Dufferin, the Ambassador at St. Petersburg, and if it was in his lordship's power to assist the Company he believed they might rely on his sympathy. The Board were doing the best they could under very difficult circumstances.

Sir ARTHUR T. F. CLAY, Bart., having seconded the motion, a discussion ensued, in the course of which the Directors were urged to show a conciliatory spirit towards the Russian authorities. It was suggested that one of them should go to St. Petersburg, and appeal at the "fountain

head" for redress. It was also contended that the concession ought never to have been accepted, as it was all in favour of the consumers, and being only for 49 years was not sufficiently long, considering the money that had been expended.

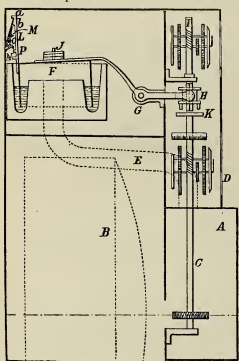
The CHAIRMAN, in reply to questions and remarks, stated that the item of "sundry debtors" related to debtors from whom they hoped eventually to recover payment; really bad debts were written off. The "expenditure in suspense" was a very old item in connection with the Company's lawsuit with the concessionaires, Messrs. Schwaben; and that reminded him that they were taking what steps they could to recover as much as they could get. No time had been fixed for payment on the deferred warrants; the Directors were obliged to use their revenue to meet debentures not renewed. Any action they took as to disposing of their undertaking to the Municipality of Odessa would simply depreciate their property, and do no good. They would be glad to dispose of it on fair terms. He had no doubt that any member of the Board would be received with every attention at St. Petersburg, but he had great reason to believe that at the present moment such a mission as suggested would do no practical good. About 18 months ago the Board sent out Colonel R. Keatinge on a special mission, and he was courteously received, but did very little good, although he had strong letters of introduction, among others one from Count Schouvaloff. Their remedy was in legislation, and he was by no means without hope that they would obtain it from the Imperial Government.

The report was unanimously adopted, and the proceedings terminated with a vote of thanks to the Chairman and Directors.

A HIGH AND LOW PRESSURE METER.

One of the novelties shown at the Special Exhibition of Gas Apparatus recently opened in Brussels is a double gas-meter designed by M. Wybraun, one of the Engineers of the Brussels Municipal Gas-Works. The meter is constructed to register on separate dials the quantity of gas consumed at different pressures; and it is specially serviceable to those consumers—manufacturers, for example—who burn large quantities of gas in the daytime, and to whom in some places abroad a reduction is made in the price of gas consumed under these conditions.

The apparatus consists of an ordinary gas-meter, but instead of the consumption being recorded upon one dial only, it may, when required, be registered upon two, which are placed one above the other. The upper dial indicates the quantity of gas consumed at high pressure, and the lower one shows the total consumption; it is therefore evident that the difference between these two numbers will be the quantity of gas that has passed through the meter at low pressure.



The working parts of the apparatus are arranged in a very simple way, as shown by the above diagram. The valve-box, A, is of the ordinary kind. The drum, B, in revolving, communicates a rotatory motion to a vertical rod, C, which, as in ordinary meters, sets in motion the hands of the lower dial, D—that indicating the total consumption. A small pipe, E, passes from the upper part of the valve-box to a rectangular reservoir, F, placed at the back part of the meter, and upon the cylindrical case containing the drum. This reservoir is sealed by the vessel which dips into it, and is covered with a leather or india-rubber lid, that falls or rises according as the pressure of the gas is low or high. This lid is attached to the arm of a lever, the fulcrum of which, G, is fixed close to the inner case of the dial-box. The arm of the lever on the other side of the fulcrum ends in a fork, that clutches and gives motion to a coupling piece, H, capable of sliding along the upper vertical rod, I, which exactly corresponds with the lower one, and actuates the dial indicating the consumption of gas at high pressure.

Supposing the gas to be at the usual day pressure, some small weights, J, placed upon the rectangular vessel, keep it down as long as such pressure lasts; consequently, the further arm of the lever being raised, the connection between the two rods is broken, and the lower dial only is in motion. When the night pressure is put on, the rectangular vessel rises, the coupling piece, H, descends, and a small horizontal rod, K, fixed upon the lower vertical rod, is clutched by the teeth of the coupling piece, and thereupon both dials are brought into action.

For convenience of description it has been assumed that the pressure of the gas is high during the evening and low in the daytime; but the meter is so constructed that it may be employed equally well whether the evening pressure be greater, equal to, or below that given in the daytime. The coupling arrangement works uninterruptedly during an entire evening, whatever may be the variations in the pressure. The apparatus is constructed to act with a certain fixed day pressure on the mains. For this purpose the rectangular vessel carries upon it a small notched rod, L. When the night pressure is on, the pawl, M, does not rest in the notch A, as shown in the drawing, but in B. If the pressure drops, the vessel cannot descend, and the two dials continue to register notwithstanding. When the period expires during which

the night pressure is given, an additional 4-10ths pressure is put on at the works; the rectangular vessel then rises, the notch, N, raises the small arm, O, of the pawl, which moves backward towards the case of the meter. When the vessel descends, a second notch, P, which is smaller than the other, causes the pawl to fall again into its former position.

NOTES FROM SCOTLAND. (FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

A tradition has long prevailed in Scotland, and has been handed down from father to son, that Edinburgh is the best-lighted city in the United Kingdom; but when actual fact is inquired into, the tradition melts into "the thin air." The fact is, that in a time when, comparatively speaking, Edinburgh was regarded as superior to other cities in respect of public lighting, but this was in the past. Since that period other towns and cities have advanced; but Edinburgh has remained stationary, or, perhaps, to use an Hibernianism, has progressed backwards. No doubt she has succeeded in maintaining the old coal-still burner, and in this respect she is ahead of one or two towns in her immediate neighbourhood; but she has much to do in the way of improvement ere she can hope to compare herself with other cities. This state of affairs is greatly to be regretted, both on account of the inhabitants themselves and of those crowds of tourists who, at almost every season of the year, visit the "grey Metropolis of the North" and who are apt to receive a wrong impression of the city after sunset. There is no reason why Edinburgh should not be better lighted, except that those in power may be of opinion that a penny saved is a penny gained. The supposition which may not unnaturally arise, that the material supplied by the two Companies is faulty or bad, must be guarded against. The gas is uncommonly pure and light, and the lamps of the Bury type, and all the good results which ought to flow from such an excellent supply are thoroughly neutralized by the antiquated methods under which the gas is consumed in our public lamps. For the information of those who are not intimately acquainted with Edinburgh, it may be stated that the city possesses one single flat-flame lamp of the Bury type, and that the Edinburgh Gas Company exhibit at the entrance to their premises two of Sugg's small Argands. Any one looking at these lamps cannot but feel the immense power which they have over existing lamps, nor can any one be so phlegmatic as to be insensible of the additional beauty which a few jets of such light would lend to the city after dark. It is not, however, so much to the general introduction of these larger and improved lanterns to all our thoroughfares that I would point, as to the necessity of overhauling existing lamps in back streets and out-of-the-way places, where certainly the traffic is not heavy, but where, nevertheless, the comfort and safety of pedestrians is much to be considered. The burner in general use on the streets is the iron union. With proper attention these jets no doubt afford a good light; but when the upper surface gets oxidized, and the small apertures get stopped up, the injury to the flame is all too manifest. This is a condition which largely prevails, and when there are added to the gas the diaphragms of which have become hardened and stiffened by the absorption of gaseous compounds, the evil is magnified tenfold. From many of these lamps the veriest peep of light is visible, and looking at such a production, one is inclined to sigh for the days of the old oil lamp. In view of the smallness of the light, I have heard that quackery is made over and over again by Managers from the South. "Why continue to make gas of such a high illuminating power, and squeeze the soul out of it at the point of ignition? Why not make gas of a lower illuminating power from a poorer coal, and burn more of it through jets of larger bore?" The queries are very pertinent, and not devoid of a degree of force. In Scotland there is a very strong prejudice against lowering our high photometrical standard, and so long as we have the rich canals and the means of producing high-class gas, it is better to keep up the standard, and rather adjust the fittings so as to give as nearly as possible complete combustion. In Edinburgh attention cannot be given to the condition of the gas, and the defective state of the public lamps. Muttering has been heard over and over again of the possibility of electricity coming into use in our large squares and open spaces. Owing to the peculiarity of its position, Edinburgh is perhaps one of the best-adapted places in the kingdom for such electrical displays, and if advantage were taken of the present state of affairs, the electric light might do much to curtail the use of gas publicly. The possibility of this becoming an *fait accompli* ought, therefore, to rouse those responsible for the lighting of the streets to a sense of their duty. There is always danger when the lamps are not trimmed.

The Perth Gas Commissioners met on Tuesday last, when it was reported that the quantity of gas made during the month of October was 556,500 cubic feet more than the quantity made in the corresponding month of last year. The average illuminating power during the month was 286 candles.

The people of Huntly are somewhat exercised as to the propriety of lighting their streets in a better manner than at present; but it seems that owing to the construction of the lamps a flat-flame cannot be substituted for the present "round-flame" burners; therefore the reform which is so greatly desired cannot be introduced.

On the 15th inst. about 15 men and 15 women of the North British Railway Company transferred the gas-works of Burntisland to the Town Council, and since then the Company have become consumers from the town. When the transfer took place, they retained their meters; and now the Council claim rent for them, but the Company refuse to pay, maintaining that the meters are their property.

At a meeting of the Huntly and District Sanitary Board, held on Wednesday, the 10th inst., the Board, who, on Wednesday, held that the Railway Company, in handing over the works to the town, handed over all the plant, and these meters being part of the whole, they belonged to the town. For their use, therefore, the Company must pay rent.

Street lighting is a burning question, and is conducted under somewhat difficult circumstances. Recently the Street Lighting Committee found that they had not funds wherewith to procure the necessary light; but they got up a concert, or entertainment of that description, and now they are out of their pecuniary difficulty.

For some time past, owing to the depression of the barometer and the fall of rain in Scotland during the past week has had a wonderful effect in raising the spirits of the good people of Greenock. Loch Thom has now some 15 or 20 feet of water, and it is expected that the factories will soon be running full time again. If there should be a sufficient fall to give a full supply of water to the sugar manufacturers, a great calamity upon the working people will be averted. In Dunbarton the rainfall has been such as to enable the authorities to double the hours of supply from five to ten; but in Crieff there are loud complaints that the springs are, in one part of the town at any rate, completely dried up.

There have been some lively proceedings in the village of Stanley, Perthshire, over a proposal to convert it into a water supply district. The village, which contains about 1500 inhabitants, is socially divided in two—the plebeians and the aristocrats. The former have been in somewhat destitute circumstances, on account of the failure of the wells supplying the village, while the latter have abundance of water for their

WANTS. The state of matters was represented to the Local Authorities of the parishes of Rodgerton and Auchtergaven by certain of the inhabitants, who wanted to convert the village into a water supply district; but the proposal being opposed by the authorities, the request was refused. The case was then submitted to the Sheriff, who has granted the prayer of the petitioners, and at the same time his lordship has administered some seasonable advice to the opponents of the scheme.

The Dundee Water Commissioners resolved, at their meeting on Monday last, not to go on with the scheme for improving the water supply. The policy of postponing what really seems to be a crying necessity is creating much comment in the town, and the Commissioners are being accused of being shiftless and weak in their conduct.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.
Contrary to expectation, no appointment has been made to the vacant managementship at the Coatbridge Gas-Works. It is now stated, however, that a special meeting of the Directors of the Gas Company is to be held on Monday evening for the purpose mentioned.

During the last week of the Glasgow Gas Apparatus Exhibition meters were put on the supply mains for the purpose of determining the amount of an average day's consumption of gas, and the result arrived at was that about 1,200,000 cubic feet of gas had been consumed over the period that the exhibition was open, the total value of which, at 3s. 6d. per 1000 feet, would be about £120. It should be remembered that the exhibition hall was lighted with gas by night, and that the electric light being almost entirely excluded. Notwithstanding the fact that there was such a large consumption of gas, and that there were upwards of 6000 gas connections, the atmosphere was remarkably pure after the ventilating arrangements were completed.

Amongst the notices already published of Bills for consideration in the ensuing session of Parliament, there is one of portentous length issued by the Municipal Authorities of the burgh of Irvine, and to which attention may be briefly directed. There are many proposals which the Bill aims at passing into law, the following being several of them:—To empower the Corporation to purchase and hold the undertaking of the Irvine Gaslight Company, &c.; to empower the Corporation from time to time to maintain, alter, improve, enlarge, extend, and renew, or discontinue the existing gas-works of the said Company, &c.; to empower the Corporation to supply gas for public and private purposes to and within the extended curtilage, and the streets and places adjacent to the curtilage of any &c.; and to empower the Corporation to provide or contract with any person or company for providing engines, works, appliances, and all necessary apparatus and materials for supplying electric light, and other light in addition to or in substitution for gas, and to use and employ the same for public and private purposes, and to erect and maintain for that purpose, this is the first instance of any Bill from a Scotch Municipality asking for parliamentary powers in connection with electric lighting.

At the meeting of the Ayr Police Commission, held last Monday, there was submitted a report from Mr. Robb, Works Manager for the Ayr Gas Company, stating that the exhibition of gas at Ayr, on Wednesday, 10th, and illuminating power equal to 26 standard candles. One of the members asked if there was no report as to the gas supplied in Newton, which is the portion of the burgh lying on the north side of the River Ayr, and which has a Gas Company of its own. The Treasurer replied that the Manager could easily supply a report like the one submitted.

I have referred a number of times during the last two or three years to the misunderstanding, now somewhat of a chronic character, existing between Councillor Tainsh and the Corporation Gas Committee of the town of Hamilton. Another burst took place at a special meeting of the public Council, which was held last night, and in consequence of considering the alleged inaccuracies in the gas accounts. Provost Forrest, who presided, called attention to a correspondence in one of the Glasgow daily papers between Bailie Cassels, the Convener of the Gas Committee, and Mr. Tainsh, his predecessor in this office, and in the course of which the latter named that he had stated, in the course of the exhibition, as shown in the printed balance-sheet, there was a loss of £299. He (Provost Forrest) had gone into the accounts, and produced a profit and loss account which he had made up, and which showed the correctness of the Committee's abstract. He also explained that the difference had arisen through Mr. Tainsh's misstarting at £298 for gas, and that the balance was £299, the difference belonging to extensions. The Provost explained further that in the printed abstract a distinction was made between "materials, manufactured, maintenance, and repairs," and "extension of works." He admitted that Mr. Tainsh had some reason for taking the £5000 in starting, but after the explanations offered he hoped that he (Mr. Tainsh) would see that the accounts were correct. Bailie Cassels stated that the Committee refused to alter one item that would affect the result of their balance, and that they insisted that the Council would either acquit or condemn them. Mr. Tainsh refused to accept the statements given, and entered upon a long condemnation of the policy of the Gas Committee, stating that he had heard from some of its members the vilest insinuations against his character and motives—insinuations unworthy of public men, as they well knew they were gross untruths. After a long discussion a vote of confidence in the Gas Committee was agreed to, Mr. Tainsh protesting.

A meeting of the Town Council of Kilmarlock was held last Wednesday, when a report was submitted by Mr. Samuel Dalziel, Manager of the Gas Works, which stated that the amount of gas sold during the four months ending Sept. 30, 1880, was 4,537,900 cubic feet, yielding £1039 18s. 8d., as against 4,832,000 cubic feet in the same period of last year, for which the sum of £1107 8s. 10d. was received. The total quantity of gas sold was—maximum, 26 candles; minimum, 25; average, 26 candles.

Business was done yesterday in Glasgow's 9 Cent. Corporation Gas Annulities at £230 per share.

An improving tendency has been shown by the Glasgow iron market during the week. Good advices from America brought about a fair business at Friday's forenoon market, when up to 52s. 1½d. closed in a few days was paid. In the afternoon transactions took place at 52s. 3d. cash and 52s. 5d. one month.

The winter demand is experienced in the Glasgow coal market, yet all orders are getting prompt attention, as there is no scarcity of stock. Prices are firm, and have in some instances been advanced.

SHANGHAI WATER-WORKS COMPANY, LIMITED.—This Company was registered on the 22nd inst., with a capital of £100,000 in 200 shares, to supply the English, French, and American settlements of Shanghai, and the native city and neighbourhood, with water, and for such purposes to purchase land situate at Tangtsee Poo of the trustees of a water-works undertaking.

CLAY CROSS WATER SUPPLY.—It is locally reported that the Clay Cross Local Board having offered the Water Company of the town £12,000 for their works, and the sum just stated, the value of the original shares, and the offer having been refused, the Board have resolved to ask the assistance of the Local Government Board in bringing about a compulsory purchase.

THE "HELIOID" CARBURETTING APPARATUS.

The Universal Carburettng Company, of No. 31, Thornhill Road, N., have recently introduced to public notice a carburettng apparatus—styled the "Helioid"—the invention of Mr. Sanders, of Farnham, Surrey. The patent for the apparatus (No. 2874 of the present year) was taken out on the 12th of July, and the specification states that the invention is for "Improvements in Apparatus for Saturating Atmospheric Air or Gases used for Heating or Illuminating Purposes with Liquid Hydrocarbon."

The apparatus—which, by preference, is circular in shape—is shown in the accompanying illustration; and it is intended that it should be fixed so as to intercept the gas from the meter or other source of supply.

As shown, the gas enters, by a vertical tube, and passes into a vertical tube covered by another tube of larger dimensions working telescopically over it. Attached to the bottom of this latter tube, to prevent the gas entering freely, is a disc of the internal diameter (or nearly so) of the case. This disc is so supported by floats as to be always resting on the surface of the liquid hydrocarbon with which the vessel is filled, whatever its level may be. The gas thus traverses laterally beneath the disc, through the liquid, and escapes at the extreme edge of the disc, at which point the small holes are pierced, as shown, thus attenuating the bubbles or streams of gas, and perfecting the saturation. At the circumference of the disc there is soldered a flange of sufficient depth to prevent the passage of the gas other than through the holes. To aid in the complete saturation of the gas there is also placed a second or inner flange, similarly perforated to the disc, or else spaced out from the disc as to leave an annular gas-way equivalent in area to the inlet-pipe of the apparatus. At the top of the main chamber a smaller one is placed not only to allow the vented gas to escape, but also to rise and fall freely, according to the level of the hydrocarbon in the carburettng vessel, but also to act as a receiver of the saturated gas.

EXHIBITION OF GAS APPARATUS AT BLACKBURN.

An exhibition of gas cooking and heating apparatus, gas burners, engines, and other appliances connected with the consumption of gas, was opened on Wednesday, 10th inst., at the Town Hall, Blackburn, on Wednesday, 10th inst., by the Gas Committee of the Corporation, and consists of exhibits from the various firms whose names are well known and whose goods are so familiar to all who attend these exhibitions. There are likewise several exhibits supplied by local tradesmen. Most of the goods are similar in character to those which have from time to time been noticed in the JOURNAL, and do not call for special notice now.

The opening ceremony was performed by the Mayor (Alderman Harrison), who was accompanied by several Aldermen and Councillors, and attended by Mr. S. R. Ogden, the Corporation Gas Manager, under whose direction the arrangements of the exhibition have been carried out.

The Mayor said he was glad that his first official appearance should be in connection with an exhibition of the present character, as he considered such exhibitions were interesting to all classes of the community. He believed that gas was only in its infancy as applied to domestic purposes, and was convinced that the gas-cooking appliances that had been already adopted to a considerable extent by the middle classes had proved of great benefit, and had conduced to economy and greater cleanliness in culinary matters. He believed the working classes would next take advantage of them, and he looked forward to the time when there would not be a cottage in Blackburn or any other town without its gas apparatus for cooking or warming. The introduction of the electric light had spurred forward the inventor, and already great improvements had been made in gas-burners; and burners which almost equalled electricity in power had been introduced into the houses and public streets of Blackburn. He believed that as to the warming of houses and public institutions was only in its infancy, and he considered that every class of the community had reason to rejoice at the perfection of gas-cooking apparatus. There were two or three gas-engines in the exhibition, and he looked forward to their adaptation to small requirements in workshops and warehouses in Blackburn and other towns. He had slightly touched upon the advantages of gas in illumination, warming, cooking, and as a motive power; and he believed that in all those departments they had an exceedingly good exhibition. He trusted it would be to the benefit of the exhibitors, and believed it would be a case of benefit to the exhibitors and to the many of the borough, and he had much pleasure in declaring the exhibition open.

Alderman BURY proposed a vote of thanks to the Mayor, and this was seconded by Alderman R. DUCKWORTH, and carried.

On the 11th inst. Alderman BURY delivered an occasional lecture on cookery by Mrs. Thwaites, of the Liverpool School of Cookery, the subjects being superior household cookery and plain cookery.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There has been a little more stirring in gas-making circles during the past week, owing to the recent foggy weather, and the consequent demand to come into the market for extra supplies of canal, but where additional purchases have had to be made there has not been much difficulty in placing orders at about late rates. For canal prices vary so much, according to quality, that quotations are scarcely possible, but for gas coals they average about 5d. per ton for common sorts, up to 7s. and 7s. 6d. per ton for the best qualities, at the pit mouth.

Other classes of round coal for house-fire purposes have been in good demand, and the pits generally throughout Lancashire are working full time. Colliery proprietors, as a rule, are holding out for advances of about 6d. per ton, and in some cases slightly more. The best quality of round firm at not less than 8s. 6d. per ton at the pit, Pemberton four-feet at 7s. to 7s. 6d., and common Wigan mines about 6s. per ton.

Common round coals for steam and forge purposes are not being pressed so much in the market, owing to a considerable quantity of these being taken into consumption for house-fire purposes, and prices consequently are harder; but where they have to be sold to manufacturers and forge proprietors, not more than about 3d. per ton upon late rates is obtain-

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TO CORRESPONDENTS.

J. M.—If you cannot see one at the Free Reference Library, Manchester, write for a copy (which will cost very little) to the Commissioners of Patents, Chancery Lane, London.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 23, 1880.

Circular to Gas Companies.

THE Commissioners of Sewers of the City of London have at length come to a decision on the proposed experimental lighting of the bridges and some of the leading thoroughfares of the City by electricity. On Tuesday last the Streets Committee, who have had the matter in hand since the beginning of July, reported to the Court that they were disposed to recommend the acceptance of three separate tenders, from as many distinct electric lighting contractors, for the three districts into which the area to be lighted has been divided. District No. 1, comprising Blackfriars Bridge, New Bridge Street, Ludgate Circus, Ludgate Hill, St. Paul's Churchyard, and Cheapside as far as King Street, is allotted to the Anglo-American Electric Light Company (the Brush system), who undertake to supply thirty-two lamps, to be lit for twelve months, at a cost of £660, besides the sum of £750 required for providing, fixing, and subsequently removing the lamps and machinery, making the total cost for the twelve months trial £1410. The number of gas-lamps replaced is about one hundred and fifty. There was a great difference in the four tenders received for this district, the one accepted being the lowest, and Messrs. Siemens Bros. being highest with an offer of twenty-nine lamps for £3700. District No. 2 comprises Southwark Bridge, Queen Victoria Street, Queen Street, and Queen Street Place, and falls to the lot of the Electric and Magnetic Company (the Jablockhoff system), who will supply fifty-two lamps for £1580, with a further allowance of £1350 for fixing and removing their plant and apparatus, or a total for the twelve months of £2930. The

number of gas-lamps to be replaced in this district is one hundred and sixty-one. The successful tender was the highest of three received, Messrs. Crompton and Co. and Messrs. Siemens Bros. being both lower, although there was not so much difference between the various tenders in this instance—a circumstance probably due to the fact that the numbers of lamps offered by the unsuccessful competitors were much less than that of the Jablockhoff candles. District No. 3 is the heart of the City, comprising London Bridge, Queen Street (north end), Cheapside (eastern end), King Street, Guildhall Yard, the Poultry, the open space in front of the Mansion House and the Royal Exchange, and King William Street. Messrs. Siemens Bros. secure this, the head-quarters division, with the offer of thirty-two lamps, for which they require £2270, and £1450 for fixing and removing their apparatus, in all £3720 for the twelve months, the number of gas-lamps replaced being one hundred and thirty-eight. Thus we see that the total cost of this extensive "experiment" will be £8060.

A description of the various lamps, and the proposed method of fixing them, accompanies the report, but need not be reproduced here, as none of the systems favoured is particularly novel. The lamps are to be suspended at various heights above the roadway, ranging from thirteen feet, as stated by the Anglo-American Company, to seventy or eighty feet in the case of the large lamps of Messrs. Siemens Bros. The methods of fixing the conductors to the lamps also differ in every case. The Anglo-American Company will carry their cables in graceful (?) festoons from post to post, and underground at crossings; and the Electric and Magnetic Company will also festoon their wires, with the further improvement of crossing roads overhead at about twenty-five feet high, unless the Commissioners will allow £2000 extra to lay the lines beneath the roadways. Messrs. Siemens Bros., however, will lay their conductors underground, and in this they show a more practical appreciation of the requirements of the case; but it is to be feared they will find a heavy proportion of their allowance for fixing swallowed up in main-laying.

It is stated on the part of the Streets Committee, that the gross cost of the experiment will be about four times the price now paid for gas lighting, inclusive of the establishment expenses. We have heard something lately concerning the elasticity of City estimates, and it would possibly be instructive to see, after the year's trial is over, a fair balance struck, including every expense to which the City will have been put in consequence of this experiment. Still, a disproportion of four to one is enough to cause an indifferent observer to inquire why it is to be incurred—whether gas lighting has failed, and a great and sudden demand has arisen for lighting by electricity. For, be it remembered, there is no question of illuminating power considered, or if considered it does not find a place either in the report of the Committee, or in the speech of the gentleman who moved its adoption in the full Court. Not even by way of preamble is it stated that "whereas it is expedient to provide better means of lighting the thoroughfares within the City, especially after business hours; and whereas it has been demonstrated that the present method of lighting by gas is a failure; and whereas it has been proved that, on the grounds of constancy, reliability, cheerfulness, and economy, the electric light is infinitely superior to gas," &c. If something of this kind had been offered by way of explanation of the action of the Commissioners of Sewers, we should have known how to regard their proceedings; but as they give no reason at all, not even so much as was vouchsafed in the late controversy about the Dragon of Temple Bar, we are constrained to believe that their motives are about equally rational in both cases, or that, from merciful consideration for the interests of gas shareholders, they decline to announce their convictions on the subject of the inefficiency of gas as a medium for lighting streets. It does not appear, however, that even all the members of the Commission are quite sure of the object of the experiment. Mr. Deputy Taylor is reported to have complimented the Streets Committee on the results of their labour in receiving the tenders, and in going about inspecting the various examples of electric lighting at present visible in the Metropolis; and probably feeling called upon to supply a meaning to the investigation, he concluded by expressing a hope that it would result in the public being supplied with an improved light at less cost than at present. Here at least we have a definite, though unofficial, object stated, and it is with quite a pang that we venture to observe that to begin by paying four times more than before is not the most obvious way of obtaining a cheaper light, to say nothing of the improvement in quality which is expected to follow. We fear

the cheapness of the experiment must not be mentioned in view of the admitted figures, which, as we have seen, may hereafter be somewhat altered for the worse.

With regard to the improvement in the lighting, there is more to be said. If the Streets Committee were to tax their memories but a little, they could scarcely fail to remember a time, not so very long ago, when Queen Victoria Street was made exceedingly brilliant, without entailing on the City the extra outlay of one shilling; the Waterloo Bridge Road was also illuminated in a very striking manner indeed, and so was Waterloo Place. Even now, if the peripatetic Committee had really cared to see how streets and open spaces can be illuminated, it is not a very "far cry" to Birmingham, where they would have been able to see again what gas lighting is capable of effecting, when freely and judiciously used. Or, if we mistake not, the Committee actually had an offer from a well-known gas apparatus manufacturer—simultaneously with the tenders of the contractors for electric lighting—to light any line of thoroughfare that might be selected, with the most improved form of powerful street-lamps, calculated to give an equal average amount of light at a lower cost than any known system of electric lighting, in order that the two methods of illumination might be witnessed in operation together, and a comparison made between them as nearly as might be on equal terms. But this is travelling beyond the record. The Commission are not so much anxious for light as for experimental research; and they will doubtless succeed in satisfying themselves, as usual, whatever may be thought of their pet project by the public. The City authorities have lately shown that public opinion has but little weight with them, so they must be allowed to follow their bent without reference to anything but their own convictions. Fortunately, however, these convictions are not always respected to any great degree outside the sphere of their own immediate influence.

We have another word to add on this matter. A member of the Commission had the temerity to suggest that the accepted contractors should be made to give security for the due performance of their contracts. For this he was promptly snubbed, and thereupon the incident terminated. It is by no means self-evident, however, that his advice was needless or inopportune. The Commissioners are about to hand over long lines of the busiest and most important streets in the world to a group of experimenters who may at any time find themselves unable to fulfil their engagements, or may become involved in unlooked-for circumstances which may compel them to suspend operations altogether or for a time. Our Parisian contemporary, the *Journal des Usines à Gaz*, publishes monthly a list of the number of extinctions suffered by the electric light in Paris, which are said to recur at frequent intervals, no less than *thirty-one* interruptions being recorded for the month of September in *two districts alone*. If this effect should occur occasionally in the City, the warning of Mr. Boor will appear prophetic to those who remember it.

The commencement of the experiment is to date from the 1st of next February instead of the beginning of the present month as originally contemplated. The Commissioners are to be pitted on account of their failure to have their great project ready before the last Lord Mayor's Show, for it will probably have lost all novelty before next November, when we may perhaps expect to see a portable electric light dragged on a van to Westminster and back, to symbolize what will perhaps be considered, at Guildhall, one of the most brilliant results of City enterprise.

It is with great pleasure that we announce that from the 1st of January next the price of gas supplied by The Gaslight and Coke Company will be reduced from 3s. 4d. to 3s. 2d. per thousand cubic feet for common gas, and from 4s. 2d. to 3s. 11d. per thousand cubic feet for canal gas. It was to be expected the great Company north of the Thames would not lag behind the present general movement in the direction of reduction in price. The Metropolitan Companies are, under the sliding scale, now working within such a narrow margin of profit, that their action in this respect must be always carefully guarded. Twopence per thousand cubic feet more or less makes a vital difference to them, and is certainly of more moment in their case than is double as much in some instances. The Gaslight and Coke Company have a very heavy capital account to provide for; and moreover, until comparatively lately, they have not been in the most favourable circumstances for the purpose of manufacture at a cheap rate. Fortunately, as their scale of operation increases, their capital obligations will be less disproportionate, and their selling price will be more easily lowered. Progress is being steadily made in this direction, and it is

highly satisfactory to notice that the commencement of another year will be marked all over London with a lessened charge for gas, and we trust that none of the Companies who have entered upon this course will have reason to regret having done so.

The preliminary notices for the next parliamentary session are appearing in tolerable plenty in all parts of the country. We have already mentioned the intended application of the South Metropolitan Company for an extension of powers as regards the compulsory acquisition of a site for new works on the river side below Greenwich. The published notice also comprises the issue of additional capital, and the amendment of the Company's Act of 1876 with respect to the restriction to amalgamation with other Companies therein contained, and contemplates the extension of the Company's powers in other respects. The Company seek for power to sell gas in bulk to any public body authorized to supply gas, or to any Gas Company for re-sale or distribution, and also to purchase, for manufacture and conversion, the residual products of any other Company, or to sell these products to another Company authorized to manufacture such articles, and to empower the Company to deal with the same. The notice is comprehensive and elastic, but is not, on the face of it, of a combative character.

A general consolidation of gas interests in Brighton and the neighbourhood is the object of a Bill to be promoted next session by the Brighton and Hove Gas Company. The Company intend to seek power to acquire, by agreement, the undertaking of the Brighton Gaslight and Coke Company, subject to the sanction of the Board of Trade, and to extend to the proposed amalgamation the provisions with respect to such procedure contained in the City of London Gas Act, 1868, with any necessary alterations. The Amalgamated Company also intend to purchase by agreement the "undertaking" of the Aldington, Hove, and Brighton Gas Company; to acquire in fee simple certain leasehold lands now occupied by the Company; and to amend, in various ways, at least ten private Acts relating to the gas supply of Brighton. From the number of Acts referred to, it would appear that the various Brighton gas undertakings have in time past been very much regulated indeed. When the Aldington, Hove, and Brighton Gas Act, 1866, was passed, much comment was made on the extraordinary precedent then created, of granting parliamentary power to a third Gas Company, when two old-established Companies were authorized to supply gas to the same town. The third Company was promoted by a number of gas consumers, who, by the help of professional cheap-gas agitators, made out a case for competition, which at the time appeared convincing to Parliament. It would be cruel to inquire too closely into the later experiences of the local promoters of the Company, which met the fate, that might have been anticipated from the circumstances attending its formation; but now at last the remaining proprietors of the Company's shares may receive something for the powers which have otherwise been so useless to them. The friendly competition of the two established Companies may also come to a satisfactory conclusion on the usual lines, and the abortive treble competition, after next year, may be legally relegated to the limbo of half-forgotten failures, to which the inexorable laws of practical business have long consigned it.

The Cambridge University and Town Gaslight Company intend to apply for powers to extend their works and raise additional capital, and also to amend the Company's Act of 1867. No local opposition to the proposed Bill can be anticipated, as the Cambridge works are generally known to be a pattern, which all others can only follow at long distances; at least, such is the inference to be drawn from the recent utterances of Mr. T. Hawksley, the Company's distinguished Consulting Engineer.

The Town Council of Lincoln are about to apply for an Act to enable the Corporation to acquire the undertaking of the Lincoln Gaslight and Coke Company, and thereupon to dissolve the Company and to extend the limits of the present gas supply. Sundry other provisions as to electric lighting, water supply, and general municipal purposes, are added to the Bill. The agreement for the transfer has been sealed for some months, and the Act will therefore only give legal effect to an arrangement that has been already concluded. There was no dissentient to the promotion of the Bill at the recent Council meeting, when the resolution for the application was agreed to. It was urged with much reason that the costs of the Bill should not come entirely out of the district rate, but be partly defrayed from the corporate funds, as the benefits to be derived from the mea-

sure would be shared alike by the Council and the Sanitary Authority. It was, however, stated that the greater part if not the whole of the expense of procuring the Act would be met from the surplus funds to be handed over by the Gas Company. There cannot, under the circumstances, be a great deal of objection to this source of the necessary money, as it is perhaps mainly on account of the gas-works purchase that the Corporation are compelled to go to Parliament. But it may be hoped that if opposition is encountered with respect to any other portion of the Bill, dealing directly with matters other than gas, the whole of the extra cost of meeting such opposition will not be thrown upon the gas consumers.

The Stone Local Board have been negotiating upon friendly terms with the Gas Company supplying their district, with reference to the proposal of the Company to apply for a Provisional Order. The Company have explained their wishes to the Board, and the latter, having objected to the application of the sliding scale clauses, and also to the intended definition of the Company's limits, have had their objections respected by the Company. The Board, however, then desired to have a clause inserted in the Order, providing for the compulsory purchase by the Board of the Company's undertaking; but this proceeding met with some opposition on the part of the Board of Trade, who concluded that no such clause could be introduced unless the price were to be fixed. Accordingly, the Company propose to insert a clause in the usual form, merely giving them power to sell their undertaking to the Local Board whenever the latter are in a position to purchase it. This solution of the difficulty appears to have so far satisfied the Board that they now consider the only unsettled question between themselves and the Company to be that of the maximum price of gas to be fixed by the Order. The Company want 4s. 6d. per thousand feet, which the Board desire to see reduced to 3s. 6d., and we should say the matter will end in a compromise, upon which the Company will proceed with their Order unopposed.

The Corporation of Hull obtained an Act last session authorizing them to supply electric lighting, and the Gas Inquiry Committee of the Town Council, having been re-styled the Lighting Committee, with powers to deal with the Act, met for the first time on the 12th inst. to consider their novel position. The occasion was remarkable chiefly for the review given by the Chairman of the relations of the three local Gas Companies with their consumers and the public. The Chairman had praise to bestow only on the British Gaslight Company, who have lately reduced their rate to 2s. 3d. per thousand cubic feet to the private consumers in their district, and taken something off the price charged for the public lamps. Against the Kingston Gas Company and the Sutton Company the Chairman laid dire complaints; and saying that the Committee were assembled to look after the interests of the ratepayers, he announced that he should call them together again very shortly, "for the purpose of taking into consideration the wisdom of utilizing the Act that the Corporation had been pleased to spend money over." This somewhat lukewarm statement seems to have acted as a damper on the rest of the Committee, for, after an interchange of the feeblest generalities on the iniquities of the Gas Companies, the members separated, evidently feeling oppressed with the terrible inciseness of the late Lord Lytton's query: "What will he do with it?" when applied to themselves individually with reference to the white elephant presented for their disposal by the enterprising Council.

After the decision of the Police Magistrate of the Thames district to dismiss their summons against The Gaslight and Coke Company, referred to in last week's "Circular," the Vestry of Mile End Old Town are still unhappy. The assertion of the Company that their contractors, Messrs. John Aird and Sons, had filled in the holes in the road in the best possible manner, and with all the excavated materials in their proper order, appears to have rankled in the minds of certain Vestrymen, who cannot understand how the evidence of their own Surveyor, backed by that of such a luminary as the Engineer of the East London Railway, could have been passed over in favour of such depositions as were those of Messrs. Aird's foreman, the Company's Chief Inspector (Mr. T. C. Hersey), and the Surveyor to the Strand District Board of Works. Under the circumstances, it appeared rational to the aforesaid local Solons to refer the subject to the Works Committee, "with a view to some of the excavations being opened again to ascertain the truth of the Company's statement!" What effect the Vestry believe this proceeding will have upon the

Magistrate sitting at the Thames Police Court it would be difficult to say. Perhaps, however, if they fail to induce him to visit the place for himself and see the stuff they may take out, they will be satisfied if, by re-making the road in their own way, it shall thereafter be impossible for the Gas Company to say that the places where the road was opened by them are in better condition than the undisturbed portions.

A reform so obvious that it is a wonder why it has not been carried out before, and has, therefore, probably suffered the more delay, is about to characterize the publication of the results of the official testings of the gas supplied to the Metropolis by The Gaslight and Coke Company, the Commercial Gas Company, and the South Metropolitan Gas Company. Henceforward the daily reports of the Gas Examiners at all the testing-stations will be published weekly, and consequently such of the public as take any interest, other than a grumbling one, in such matters, will be able to follow week by week the variation in the illuminating power, purity, and pressure of the gas supplied to the greater portion of London. We hope to see these reports occupy a space in the newspapers as regularly as do the meteorological tables; for it is surely of as much importance to a Londoner to know how his gas, in the light of which he spends half his waking hours, is being kept up to the prescribed standard, as it can possibly be to know how many hours in the week the sun has shone at Greenwich; for that luminary is at this time of the year too often invisible to him to be regarded as a very intimate acquaintance. We shall not be surprised if the publication of these reports is the first intimation to a number of people that anything like a regular and really systematic watch is kept over the proceedings of the Gas Companies. Many people seriously believe that the Companies supply anything they please, so long as they call it gas in the bill, and charge for the accommodation any figure that first enters their imagination as being likely to be submitted to by the consumer. It is hard to educate the public, but it may be expected that the greater publicity that is given to such statements as those about to be supplied by Mr. T. W. Keates, the Chemist to the Metropolitan Board of Works, in the manner described, the less room will there be for senseless agitation and baseless discontent.

Water and Sanitary Notes.

At last the oracle has spoken. The Standing Orders decreed by the Legislature have elicited a declaration in the shape of a parliamentary notice, which, like all such announcements, speaks with many meanings, as becomes an oracle. The inspiration is from the Home Office, and the terms of a Bill to deal with the London Water Supply are thus set forth. Such notifications always take as wide a range as possible, though capable of being limited in their scope when finally dealt with. According to the published notice, application will be made in the next session of Parliament for leave to bring in a Bill to create a "Water Authority," so constituted as to represent the consumers of water in London and the adjacent districts. As much as this was recommended by Sir William Harcourt's Select Committee of last session. But more is proposed by the official advertisement, though it by no means follows that the Legislature will grant all that is to be asked; or, indeed, that all will be asked which now appears in the notice. If the Bill were passed in the form now indicated, the Water Authority would at once have power to purchase the undertakings of the Companies, the funds raised for the purpose being based on the security of the rates. Or the Water Authority might proceed to "ascertain" whether it would not be advantageous to have recourse "to other sources of supply than those now used by the Metropolitan Water Companies," whereupon the Authority would have power "to promote and prosecute in Parliament all such measures as they might think fit for carrying out these objects." The plan, therefore, seems to be that of giving the Water Authority power at once to purchase the existing works, without again approaching Parliament on the subject; but, if the Authority wish to introduce a supply from a new source, they will have to lay their scheme before Parliament. The power of purchase is to be of such a nature that it may extend either to all the Companies, or to some of them only, so that the supply might be of a mixed nature—partly from a new source, and partly from the old. The purchase—supposing it to take place—is to be by agreement or by arbitration, and compulsory powers are sought, to be exercised, if necessary, so as to "require and compel such Companies respectively to sell

"their undertakings, or any parts thereof, to the London Water Authority." The phrase "or any parts thereof," coupled with the word "respectively," points to a species of vivisection, taking away part of the district of a Company which is otherwise left to survive. The Companies comprehended in the scheme are the eight already known as "Metropolitan." Another feature is that of transferring to the Water Authority all the powers in respect to the Metropolitan Water Supply now vested in "any public Board or Authority." By this provision the functions of the Local Government Board, the Metropolitan Board of Works, and the Vestries, in respect to the water supply, would come to an end. Concerning the constitution of this new organization, all we learn is that it shall be representative of "the consumers"—a phrase which might be supposed to indicate a direct representation as desired by Mr. J. Beal and his friends, but which will also admit of an interpretation of another sort. As might be expected, the notice is signed by Messrs. Martin and Leslie, who were the agents for the Bill brought forward last session by Sir R. Cross.

Comparing the scheme sketched out above with the recommendations of the Select Committee presided over by Sir W. Harcourt, we are struck with the apparent omission of one course contemplated by the Select Committee—namely, "regulation of the powers of the existing Companies, as in the case of the gas supply." This may possibly be included in the statement that the Bill is "to confer upon the London Water Authority such powers as may be necessary or expedient for securing to the consumers, at reasonable rates, a greater efficiency in the supply of pure and wholesome water for domestic and other purposes." But the inclusion of a regulation scheme is by no means obvious, and the tenor of the notice is not favourable to such an idea. The Select Committee suggested three courses—regulation, a new supply, or the purchase of the old undertakings. The notice for the Bill next session can scarcely be said to recognize the first of these recommendations. The contemplated procedure differs in another respect from that which the Committee advised. Having set out the three courses, the report went on to say: "It would be the duty of the Water Authority maturely to examine which of these schemes, separately or in combination, would be most advantageous to the public. In order to give effect to any of them, further statutory authority would be necessary, so that the judgment of Parliament on any scheme adopted by the Water Authority would be finally reserved." The notice for the Bill proposes more rapid action than this, even to the extent of giving the Water Authority immediate purchasing power. We shall be greatly surprised if such power as this is conferred, unless the terms of purchase are in some way previously settled, which itself is a very unlikely thing. Of this we may be sure, that there will be a "big fight" next session over the Metropolitan Water Question, but when or how the war will end is more than the wisest among us can determine.

The Metropolitan Board, or certain members of that body, having challenged the authority of the Vestry Delegates in respect to the water question, Mr. J. Beal has made an ingenious and rather pungent response. He contends that the Delegates who meet at St. Martin's-in-the-Fields are duly authorized by their several Vestries, and are in the possession of certain powers, the legality of their proceedings having been affirmed by the opinion of Mr. Pashley, Q.C., at the time of the gas agitation. According to Mr. Beal, the Metropolitan Board, and not the Vestry Delegates, are the parties who have made the mistake of meddling with the water question without legal authority. Thus, the Metropolitan Board were surcharged £16,000 for the expenses incurred in producing their abortive water scheme, and had to obtain a special Act of Parliament in order to settle the account. "Those who live in glass houses should not throw stones," and Mr. Beal has made a fair retort. But the Vestry Delegates are a mutable body, and are likely to fall away from their leader. The Vestries themselves are not all agreed as to the merits of the water question. At Lambeth, for instance, they have just appointed a Committee to report on the suggestions of Sir W. Harcourt's Select Committee—a step which comes rather late in the day. But, in addition, a resolution has been carried, requesting the Committee to inquire "whether the interests of the houseowners and ratepayers would not be better served by London being divided into north and south, the Thames being the dividing line, two bodies being the controlling agents." We presume that Lambeth is afraid of being neglected, should a central body be appointed, inevitably holding its sittings on the north side. What does Lambeth

say to the scheme of Mr. McCullagh Torrens, making every Metropolitan Borough its own authority for everything? But the idea of a division between north and south is one which might be wisely considered by the Water Companies as the basis of an amalgamation.

As there are floods in the provinces, so London would seem likely to be inundated with schemes of "water supply." While the present Home Secretary would let in unbounded streams from fresh sources, we are threatened with "spring water" from Hampshire, and another enterprising Company would bring up "sea water" from the south coast. If the operations of the former Company are to be measured by the length of their parliamentary notice, they must be ready to bring in a deluge, if Parliament will only permit. The Government notice for dealing with the entire Metropolitan Water Supply is not more than one-fourth as long. The "spring water" Company style themselves "South Metropolitan," but take a considerable slice from the Outer Ring. The scheme has been heard of before, like the "sea water supply" project. The latter is designed to furnish a supply of water from the English Channel, to be sold in bulk or otherwise, for public and for private use. One of the proposed conduits goes under the Thames, and finds its terminus in Hammersmith, while another finishes off in Victoria Street, Westminster. Fulham, Kensington, Chelsea, and a host of other places, are thus to be put *en rapport* with the briny ocean. The Metropolitan Board were of opinion last year that there was no room under the leading thoroughfares for any more pipes. We presume the sea water supply scheme is now designed so as to avoid the thoroughfares where the chief objections arose on the former occasion. Still, in all probability, the promoters of the scheme will fail to satisfy Parliament as to the pressing need for the service they propose to render.

After a somewhat stormy discussion, which the Mayor thought at one time was "getting a little personal," the Manchester City Council have approved a resolution passed by the Water-Works Committee, thanking Mr. Grave for his "long and effective service" as Chairman. The resolution at the same time contained an expression of regret at the circumstances which led to Mr. Grave's resignation. The Water-Works Committee adopted the resolution unanimously, and in the Council it was carried by a large majority. Great credit was given to Mr. Grave for the Thirlmere scheme, one of the speakers observing that the property had been obtained on terms far below those which would now be required.

The West Kent Main Sewerage Board are willing to receive into their drainage system the sewage of the district appertaining to the Lower Thames Valley Main Sewerage Board, the financial terms of the agreement being that the latter should pay "not more" than £100,000 to the West Kent Board, and also contribute an annual sum not exceeding one halfpenny in the pound on the rateable value of the district, towards the cost of cleansing the outfall. While West Kent is thus willing to receive, it is not quite clear that the Lower Thames Valley is disposed to pay. Yet something must be done, and the West Kent outlet offers one way out of a serious difficulty. The Conservators of the Thames may be said to be driving the sewage above London into the river below London. But weighty objections lay against the Molesey irrigation scheme, and on public grounds the West Kent route is decidedly preferable. While no sewage scheme is perfect, one may be vastly better than another. It is a pity to waste the sewage, but it is still worse to run the risk of damaging the drinking water of a large portion of the Metropolis, by placing a sewage farm just above the intake of a Water Company.

MESSRS. GEORGE BRAY AND CO. have received orders for the lanterns needed for the lighting of the new station of the Caledonian Railway Company at Carlisle; 107 of their patented lanterns (globular pattern) being required.

PRESENTATION OF A TESTIMONIAL TO MR. T. HAWKLEY.—The Directors of the late Nottingham Water-Works Company formally presented, on Tuesday last, a testimonial in silver, consisting of a centre ornament, two desert stands, and a salver, to Mr. Thomas Hawksley, C.E., F.R.S., in acknowledgment of his services as their Engineer-in-chief from the commencement of the undertaking in 1850 to the dissolution of the Company in 1880, a period of 30 years.

THE PUBLIC LIGHTING OF TETTENHALL.—In the JOURNAL for the 26th ult., p. 653, it was stated that a public meeting of the inhabitants of Tettenhall had decided on lighting certain portions of the district with gas. No action in the matter was, however, to be taken until the project had been submitted to another public meeting for final approval. This meeting was held on the 13th inst., when it was unanimously resolved to carry out a system of public lighting by means of 80 lamps, to be under the supervision of twelve inspectors, and the expense incurred to be within the amount that would be covered by a rate of 5d. in the pound upon the property included in the district to be lighted. The Wolverhampton Gas Company have offered to supply gas to the lamps at the rate of 2s. 5d. per lamp per annum.

THE ELECTRIC LIGHTING EXPERIMENTS IN THE CITY.

In to-day's "Circular to Gas Companies" we have dealt at some length with the decision of the Commissioners of Sewers of the City of London to carry out their long-projected experiment in electric lighting. There are, however, in connection with this decision, certain other considerations to which we may call attention. It will be seen that the experiment resolved upon, the preparations for which are now fairly in hand, is by far the most important and ambitious that has yet been attempted. Far from desiring to find fault with the extent to which the City Authorities are proceeding, we are of opinion that they have adopted a wise, if not an inevitable resolution in seeking a means for more effectually lighting the City thoroughfares, and that the money to be spent will be productive of at least as profitable results as have followed the expenditure of much larger sums by them in days that are very recent, as well as those more remote. The wide area and varied character of the streets and places that are to be the scene of the experiment are well calculated to afford the authorities and the public a fair opportunity of judging of the capabilities of the electric light for street illuminating purposes, while the entrusting of that area to the representatives of three different systems of applying the light, will add materially both to the interest of the trial and to the value of the conclusions which may be expected to be derived from it.

As the amount of money to be paid to the contractors for the new light is largely in excess of the sum hitherto paid to the Chartered Gas Company for the lamps to be displaced, it must be presumed that a considerably increased amount of light is expected to be supplied, although there is no indication of such a general conclusion having been arrived at. We are surprised, therefore, to observe that it is proposed to maintain the full illumination from sunset to sunrise. This is an extravagance that has not hitherto been considered necessary in applications of the electric light for street illumination, and in the many cases lately, where, for special purposes, the gaslight of streets or crossings has been largely increased beyond the ordinary standard, the excess supply has been turned off at or about midnight. The present experiment will be as effective, while much less costly, if the same practice is observed, though it would probably involve considerably more trouble in setting out the position of the lights.

We are specially concerned now to express our regret that the experiment in the direction of improved lighting of the City streets is not to be carried a few steps further. The definite proposal adopted is to replace 449 gas lights, costing, at say £3 15s. per lamp per annum, a total of £1684, by 116 electric lights, costing, at least for the first year, £8060. This, by the way, appears to be an increase of nearly five times in the cost of lighting this particular area of the City, and not "about four times," as the report "roughly estimates" it. Now, it seems absolutely essential to arriving at any useful or intelligent conclusion from this experiment—first, to learn whether the Lighting Authority consider it necessary to increase largely the amount of light that has been hitherto deemed sufficient for the streets, and, so deeming, are prepared to pay for it; secondly, additional light being required, to determine the source from which it can be best and most economically obtained. This surely is so natural and common-sense a view of the question, that we are astonished to find that no invitation has been given to the Gas Company, and no effort otherwise made to ascertain what effect could be produced with gas, if present restrictions as to quantity and cost were practically taken away, or at least materially widened. If, for instance, in the section assigned to Messrs. Siemens Bros., and at present lighted at a cost of about £500 per annum, the Gas Company were told to afford the best light they could give for seven times the money, it is at least probable that London Bridge and the rest of the section would, after dark, present a very different aspect from that which it now bears. Assuming that one or more of the three divisions will be pronounced as lighted satisfactorily by the new method—and the continuance of the Embankment illustration and some others shows that this is possible, notwithstanding the previous City failure—then it is inevitable that the comparison herein advocated must be made before a change is determined upon. How much better, if the experiment is really intended to find out the best and cheapest light, that all should proceed together, and the opportunity for comparison be thus afforded. In regard to electric lighting, the City Corporation have followed the lead of the Municipality of Paris. The latter have taken

and are still taking great pains to test the relative merits of the two lights; and it is to be hoped our own authorities will not come short of their example, either in the completeness or fairness of their investigation.

We are reminded by the reference to Paris that there the Gas Company did not wait for the initiative to be taken by the Municipality, but themselves promptly offered practically to co-operate with that body in their inquiries. We have not heard of any such overtures having been made by the Chartered Gas Company, though, as is stated elsewhere, a tender with this view was sent in to the Committee of the Commissioners of Sewers, by a gentleman to whom the gas industry owes much, and whose enthusiasm for and faith in gas is widely known. While expressing surprise that no mention was made of this offer in the Committee's report, we cannot but feel that it held a very different position to that of a similar overture from the Company. The Corporation are, of course, the masters in their own domain, and may elect to make their trial one-sided or not at their pleasure; but there should be no slackness on the part of the great representative Gas Company to avail themselves of an opportunity, if it is afforded, to display, as the Paris Gas Company have so admirably done, the great, though at present undeveloped, because uncalled-for capabilities of gas lighting. In the case of the City experiments we yet hope to hear that this most elaborate exposition of public lighting by electricity will be accompanied by an equally well-considered demonstration of the powers of gas for the same purpose.

Apart from the omission of the Committee to invite a competitive tender for gas lighting, we think they have fallen short in another particular that might have been observed where so much was being attempted. Only the principal thoroughfares of the districts described in the report are to be lighted by electricity, and the byways and cross streets are still to depend on the more modest, but also more facile, gas-lamp. Consequently, the one will intrude upon the other, helping or marring, as the case may be, each other's respective effects. If a certain area, with its large streets and small alleys alike, could have been apportioned to each of the competitors for public favour, there would have been imparted to the experiment an air of real business which the present selection somewhat lacks.

GAS LEGISLATION FOR 1880.

(Concluded from p. 767.)

THERE were two Acts passed during the late sessions of Parliament authorizing the transfer of gas undertakings to public authorities:—

The *Hinckley Local Board Gas Act* sanctions the transfer of the undertaking of the Hinckley Gaslight and Coke Company, Limited, to the Hinckley Local Board. The Company were incorporated and registered in 1872 under the Companies Acts, 1862 and 1867 (for the supply of gas in the parish of Hinckley, in Leicestershire), with a capital of £20,000 in £10 shares, of which £7 10s. per share is paid up. The Company have no private Act. By the present Act the district of supply is extended to the limits of the local government district of Hinckley, and the parishes of Burbage, Stoke Golding, and Higham-on-the-Hill. The undertaking is to be vested in the Board on payment to the Company on January 1, 1881, of (1) the sum of £500 for expenses to be incurred by the Company after the transfer, and of the expenses of winding up the Company; (2) the sum of £1125 for dividend after the rate of ten per cent. per annum on the paid-up capital of the Company for the last nine months of the current year; (3) the amount of the parliamentary taxed costs of the Company incurred in the petition presented by them against the present Act, up to the withdrawal of such petition; (4) the sum of £15 for every £10 share in the Company's capital the holder of which shall not prefer to receive debenture stock for the same. The Company are to carry on their business as usual, without alteration of price or capital, until the specified date of transfer; but, if necessary, they may borrow any sums, not exceeding £4000, required for extensions up to that time, inclusive of any sums so borrowed since Sept. 29, 1879. When the undertaking is transferred in manner specified, all receipts for gas, &c., supplied by the Company since March 25, 1880, are to be handed over to the Board. The Board are empowered to create and issue the necessary debenture stock bearing interest after the rate of four and a quarter per cent. for the redemption of the shares of the Company. The Board take power to borrow £40,000, on mortgage of the gas undertaking and the general district rate, to include the debentures issued to Shareholders of the Company; and

all debenture stock so issued is to be redeemed within fifty years from the date of issue, by a proper sinking-fund, by an annual appropriation, or be secured by annuity certificates. Returns as to the operation of the sinking-fund are to be furnished annually to the Local Government Board. The revenues of the undertaking are to be applied to discharge the working and capital expenses of the same, and in the improvement and extension of the works and mains; any surplus to go to the general district fund, provided that if the price of gas is more than 4s. per thousand cubic feet, the first application of any disposable surplus is to be for the reduction of the price to that rate. The Board are empowered to charge a maximum price of 5s. per thousand feet within the district of Hincley, and 5s. 6d. per thousand feet elsewhere, before making up any deficiency of revenue from the district fund. The Board take power to acquire certain lands compulsorily, for the manufacture and storage of gas therein, and may also purchase, by agreement, any other lands in their district, not exceeding four acres, for the purposes of their undertaking other than the manufacture of gas or residual products. The Board may also supply gas in bulk to the Sanitary Authority of any district adjoining their own. Fourteen-candle gas is to be supplied at the usual pressure, to be tested at the works.

The *Lancaster Corporation Act* is in six parts, the first of which relates to gas and lighting. This part refers to the acquisition by the Corporation of the undertaking of the Lancaster Gas Company, by virtue of an agreement between the Company and the Corporation, dated May 9, 1879. The Company obtained a special Act in 1856, and again in 1879, the latter Act containing the agreement for transfer referred to. The present Act makes provision for giving effect to this agreement. The Corporation are empowered to borrow for purposes relating to gas any sums not exceeding £115,000. On payment of the specified consideration according to the agreement, the Corporation are to become proprietors of the gas undertaking; and the deed of conveyance executed by the Company is to be produced to the Inland Revenue Commissioners within three months from the transfer. The mortgage debt of the Company, amounting to £7000, with interest from July 1, 1880, is made a first charge on the gas revenues and borough-fund, and all liabilities and assets of the Company are transferred to the Corporation from the same date. The Corporation are to issue four per cent. stock for the purpose of carrying out the provisions of the Act, to be redeemed in sixty-five years. The gas revenue, after payment of all establishment and capital charges, and including the income from the reserve-fund when the latter exceeds £12,000, is to be carried to the borough-fund. The Corporation take powers to supply the electric light, and to apply to this purpose not more than £5000, secured on the borough-fund.

Two Local Authorities obtained revision and extension of powers with respect to their gas undertakings:—

The *Denton and Haughton (Gas) Act* alters the provisions respecting the dissolution of the Dukinfield and Denton Joint Gas Committee, and makes further provision for the supply of gas to the townships of Denton and Haughton, in Lancashire. The undertaking of the Dukinfield Gas Company was by the Dukinfield and Denton Local Boards (Gas) Act, 1877, vested in a Joint Committee of the Local Boards of Health for the districts of Dukinfield and Denton, in consideration of the payment of certain annuities to the Company's Shareholders by the Local Boards. By the Act of 1877 it was provided that the Joint Committee might at any time be dissolved by mutual consent, or after the expiration of six years, by either of the Local Boards giving six months notice to the other to this effect; and that in such case the district was to be divided proportionately. In the present Act it is the Denton and Haughton Boards which desire to establish works of their own, to dissolve the old Joint Committee, and to form a Joint Committee between themselves independently of the Dukinfield Board. The powers of the Dukinfield and Denton Committee to construct works in Denton are extinguished by this Act. The Joint Committee take power to acquire certain lands for the purpose of manufacturing gas thereon, and also to purchase additional lands to the extent of five acres for other purposes of their proposed undertaking. The Dukinfield and Denton Joint Gas Committee are to be dissolved as soon as the new Joint Committee's works are completed. The Local Boards are authorized to borrow the necessary sums for defraying the cost of the Act; for the purchase of land and the erection of gas-works, and for working capital (£30,000); to pay off the mortgage debt (£2000) of the late Dukinfield Gas Company;

and to redeem the Denton gas annuities at a rate not exceeding twenty-five years purchase. The surplus profits of the gas undertaking and the interest on the reserve-fund when the latter amounts to £2000 are to be carried to the credit of the district-fund. The Joint Committee take powers for electric lighting for a period of ten years, and may devote to this purpose £5000 from their gas capital.

The *Oldham Improvement Act* confers powers on the Corporation of Oldham, among other things, in relation to their gas undertaking. The limits of the Corporation gas supply are extended to the district of Royton, Lancashire, and to include the area added by the Act to the borough. The Corporation may charge an additional twopence per thousand cubic feet for gas supplied outside the borough. The Corporation may supply gas in bulk beyond the limit of their supply, and also to any applicant not residing within the district of any other authorized gas supply. The Corporation are empowered to supply gas for heating purposes, and also to institute a system of discounts. They protect themselves from loss on services, &c., and insert various regulations with respect thereto. The Corporation may also sell their gas-pipes and apparatus to any outside Sanitary Authority within whose district such pipes may be laid; and may also separate their gas and water undertakings, and charge their capital obligations separately in respect of the same. Gas and water works reserve-funds may also be established, together or separately, to the extent of £50,000 respectively, under the usual conditions. During a period of five years from the passing of the Act, the Corporation may light streets and public places by electricity, and may also supply power by like means. For these purposes £5000 may be borrowed, to be redeemed in ten years.

THE DETECTION OF INFLAMMABLE GASES MIXED WITH AIR.*

The detection and measurement of inflammable gases mixed with air present a problem the successful solution of which interests the gas engineer as well as the mining engineer. What is required is an instrument which shall be portable in size and simple in working—an instrument that can be carried down the shaft by the miner, or applied to the gas-main by the foreman. Mr. Liveing's new instrument is correct in principle. Its indications depend on the chemical combustion of the inflammable gases present.

Hitherto most of the attempts made to construct an instrument which shall give warning of the admixture of inflammable gases with the air in coal mines, have been based on the fact that the inflammable gases met with are lighter than the air, and, consequently, that the mixture produced is less dense than the atmosphere. In the ingenious apparatus devised by Professor Forbes, this diminution in density is made evident by the alteration in pitch of the note sounded by an organ-pipe. Since the velocity of sound increases as the density of the vibrating medium diminishes, the sound-wave takes less time to travel the length of the pipe when filled with the lighter mixture than when filled with air. Now the fundamental note which a closed organ-pipe emits in air is the note produced by sound-waves, whose length, from crest to crest, is four times the length of the pipe, falling on the ear at a rate depending on the velocity of sound in air; in other words, the velocity of sound in any medium is equal to the frequency multiplied by the length of the waves. When the velocity of sound is increased by a diminution in the density of the medium, and the wave length (corresponding to the length of the pipe) is kept constant, it follows that the frequency with which the waves from the pipe fall upon the ear is increased, and the pitch of the note raised accordingly. As Mr. Liveing points out, this instrument would fail to detect the presence of a light combustible gas such as marsh gas, if a correspondingly heavy gas such as carbonic acid were present in about the same proportion; and yet atmospheric air mixed with 8 per cent. of marsh gas and 8 per cent. of carbonic acid is highly explosive.

The instruments the indications of which depend on the superior rate of diffusion of light gases over heavy gases—such as the apparatus of Mr. Ansell, recently noticed in our columns—are open to the same objection. They act when plunged into an atmosphere less dense than the air, but do not indicate anything when immersed in an explosive or inflammable gaseous mixture of the same density as the air.

The luminous cap observed over the lamp flame when the air contains inflammable gas, is the rough test used by the miner for the detection of fire-damp. It is a good qualitative test, but not sensitive enough. Mr. Liveing says:

The tail or cap observable upon a flame when brought into an atmosphere contaminated with combustible gas is nothing more than a region where the weak mixture of gas and air receives sufficient auxiliary heat to sustain its ignition temperature, or, in other words, to burn. It is then a direct combustion test, and therefore on the right principle. There are, however, some drawbacks to it. There is a general feeling that it is not sufficiently sensitive; and many hold, further, that there may be a wide difference in the percentage of gas that may be present before the cap makes its appearance. Whether this is correct or not, I am not prepared

* "On a New Instrument for the Detection and Measurement of Inflammable Gas in Mines." By E. H. Liveing, Assoc. R.S.M. Read before the Philosophical Society, Saturday, June 26; and published in the *Philosophical Magazine*.

to give a decided opinion; but, from experiments made, I consider 2 per cent. of marsh gas about the limit detectable with the ordinary Davy flame. A small and clean flame is an essential requisite in applying this test; any particles of ignited matter on the wick will readily produce a spurious cap when no gas exists.

In Mr. Liveing's instrument the combustion of the inflammable gases is kept up artificially by means of heated platinum, the temperature of which is increased by the combustion thus caused to take place in its immediate neighbourhood. He says:

A mixture of marsh gas and air in which the marsh gas forms less than 5 per cent. of the mixture is not explosive or capable of continuing its own combustion (at ordinary temperatures and pressures), simply because the heating value of the marsh gas is insufficient to raise that large excess of atmospheric air to the necessary ignition temperature. If, however, such a mixture is exposed to some sufficiently heated object, especially if that object is platinum, it will burn in its immediate contact and neighbourhood, and in so doing add materially to the temperature of the object, and the more so the larger the percentage of gas present.

This principle Mr. Liveing carries out as follows:—A current from a magneto-electric machine is made to pass through two similar spirals of fine platinum wire. One spiral is enclosed in a small closed glass tube containing air, the other in a cylinder of wire gauze closed at the end with a glass plate. Since the two wires have the same resistance and cooling surface, they will be heated by the current to the same temperature, and will give out equal quantities of light, so long as the atmosphere surrounding them is the same. But if the instrument is plunged in an atmosphere containing only 1/400th of its volume of marsh gas, and the wires are heated to redness, the exposed spiral shines with greater brilliancy than the other. As the percentage of marsh gas increases, so does the brilliancy of the exposed wire surpass that of the enclosed wire, and this difference in brilliancy is the means of determining the percentage of inflammable gas present.

To measure the difference in brilliancy of the platinum spirals, a moveable wedge-shaped screen is used, one surface being illuminated by the exposed wire, the other by the enclosed wire. On the instrument is marked a scale which gives the percentage of marsh gas, corresponding to the difference in illuminating power, so that when the two sides of the screen are equally illuminated the index points to the percentage of marsh gas in the air.

The following table gives the relative illuminating power of the spirals when the instrument was plunged into mixtures containing different proportions of marsh gas:—

Percentage of Marsh Gas (CH ₄).	Relative Light of Platinum Spirals. Exposed.	Covered.
0	1.00	1
1	1.94	1
2	1.65	1
3	2.78	1
4	5.10	1
5	22.00	1
6	64.00	1

When the exposed wire is very much more brilliant than the other, it is difficult to compare the lights, owing to their great difference in colour. One-half the screen turned towards the exposed spiral is coloured orange, and, when more than 2 per cent. of marsh gas is present, this portion of the screen is used for comparison with the white face turned towards the redder light. Its orange tint destroys the whiteness of the light, and the comparison is thus made easy by a device which is inapplicable to a photometer, but permissible in an instrument in which the scale is determined experimentally.

Mr. Liveing suggests another application of his instrument besides its use in mines—namely, for the examination of the heat value of the gases allowed to escape from blast furnaces. Hydrogen and carbonic oxide act in the same way as marsh gas when mixed with air and exposed to the heated platinum. A sample of the waste gases would have to be mixed with a definite quantity of air, to supply oxygen for their combustion, before they were drawn through the instrument.

STATIONARY ENGINE DRIVING.*

It is difficult to describe this work so as to assign it to its proper place in any class of literature. The author calls it a practical manual for engineers in charge of stationary engines, by which we suppose him to mean engine-men and stokers, to whom we see his work is dedicated. If any of these classes of workmen should by chance take up a copy of the book, they might possibly feel flattered by the author's compliment; but it is not easy to imagine them perusing Mr. Reynolds's crimson-gilt volume for information, and if they did we fear they would be disappointed. The general public rather like to read, in newspapers and magazines, sketchy articles telling them what they already know; and of this kind of pabulum there is a liberal supply in all publications intended for the ordinary reader. But by no means follows that the same treatment of a scientific or business subject will meet with favour at the hands of a public of specialists. Mr. Reynolds certainly does give a few hints and suggestions of value in their way, but they are merely run through his pages to serve as a frame to be filled in with a painful mass of padding. A boy fresh from school might learn from Mr. Reynolds's book something of the construction and manner of working of various kinds of steam engines and boilers in common use; but the volume is not one of an educational series, nor would it be fit for such a position for many reasons. On the other hand, he would be a curious specimen of a driver or stoker who would need a book to acquaint him with one-fiftieth part of the gossip we repeatedly find Mr. Reynolds indulging in; and the remainder

might be condensed into cheap pamphlet form with very manifest advantage, and more probability of reaching the men to whom it is addressed.

Mr. Reynolds gives his subject a very wide frontier, ranging from the manufacture of iron to the solution of arithmetical problems involving fractions, with a chapter on knotting and splicing, &c. This is all very well in its way, but is it engine driving to any greater degree than it is coaching? The author might contend that a good stoker ought to know all about the manufacture of the iron of which his shovel is made, or the geology of the coal measures from which his fire is fed. It may be so, but he would not be a better stoker in consequence, and if he wishes to acquire this unnecessary although interesting lore, he can obtain it without reference to his being a stoker, or reading it in a "practical manual" of engine driving. Mr. Reynolds manages to fill 265 pages with what he has to say, and as he goes over his entire subject with every fresh example of a particular class of machine, it is needless to specify all the instances in which he repeats himself *verbatim*. It would be irritating to our readers to quote many of his passages, but one or two may be taken as a sample of his style. He is enumerating a few common causes of failure of the supply of steam, and he gives this as one of them:—"An engine-man became short of steam through allowing the flues to be choked up with soot." Again:—"An engine-man took his feed water from a brook, and allowed some chips to enter the engine-well, which were drawn up the suction-pipe into the pump, and, getting under the clack, disabled it." This is the kind of matter with which to make up a "practical manual" of substantial size on almost every known handicraft, and if Mr. Reynolds's readers like it, he can find himself work in compiling similar "manuals" for the remainder of his days.

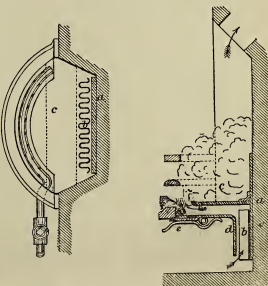
The book is well got up, and furnished with several good plates, as well as numerous diagrams and illustrations scattered throughout the text. The chief thing that we have to complain of respecting it is its laborious and unnecessary inflation. Condensed to the proportions natural to its importance, it would be less showy but far more useful.

Notes.

This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

DR. SIEMENS'S GAS FIRE.

In a recent number we commented on the letter of Dr. Siemens to *The Times*, wherein he described the particular kind of gas and coke fire which he has adopted for his own private use, and recommends as promising, if universally introduced into town houses, a complete deliverance from the smoke nuisance from which London suffers so much. The accompanying illustration, taken from a recent number of *Nature*, sufficiently explains Dr. Siemens's arrangement.



The essential parts of the permanent fittings of the grate consist of a copper plate, *a*, 1/2-inch thick, fixed in the back of the grate and extending about 5 inches above and below the fire-bar level. To this is riveted the iron dead-plate, *c*, which covers the bottom of the grate with the exception of the space immediately behind the front bars, to allow for the rising gas-flames from the perforated gas-pipe, *g*, shown in position. The copper back-plate, *b*, is provided, underneath the dead-plate, with a frill, *d*, made of 1-16-inch sheet copper, and in front of this is the angle-plate, *e*, with trap-door, *f*, for removing ashes. The grate is first filled with coke, and the gas from the pipe, *g*, is then lighted, and the flame impinges on the front of the coke. The flame is not at atmospheric pressure, the pipe being merely pierced with holes 1/2 inch apart. As the coke becomes heated, it commences to undergo a slow combustion, thus assisting the gas to radiate heat. The copper back-plate acquires heat by contact with the coke, and this heat being conducted through the frill, *b*, heats the air which goes to feed the combustion of the gas and coke, thus increasing the useful effect, at the right point, by the help of heat drawn from the back

* "Stationary Engine Driving: A Practical Manual for Engineers in charge of Stationary Engines." By Michael Reynolds, M.S.E., &c. London: Crosby Lockwood and Co. 1881.

of the grate, where it would be otherwise wasted. Dr. Siemens states that the result of a day's working of one of these combination fires was the consumption of 62 cubic feet of gas, costing, at 3s. 6d. per 1000 feet, 2.604d.; with 22 lbs. of coke, worth, at 18s. per ton, 2.121d.—together, 4.725d. for nine hours, or 0.524d. per hour. The grate when consuming coal cost 0.635d. per hour; thus showing a decided economy in favour of the former system, while it had a better effect in warming the apartment, and was, moreover, thoroughly smokeless. In common with other gas fires, this, of course, possesses the advantage of being always ready for use at a moment's notice, giving no trouble, and being very cleanly. If a less expensive arrangement than the above is desired, a simple close-fitting ash-pan can be made to cover the fire-bars of an ordinary grate, and the gas-pipe laid in front of it, as before described. This ash-pan needs emptying only at intervals of several days, and the device works well; but the appearance of the fire is not so brilliant as when the hot-air arrangement is added. Dr. Siemens considers the use of raw coal in fires almost barbarous, and believes that the time will come when all fuel will be divided into its two constituents, solid and gaseous, before reaching the factory furnace or the domestic hearth.

GAS FROM CORK.

Experiments are now being made in one of the courts of the Paris Opera House to determine the suitability for general use of gas made from cork refuse. It is stated that the process has been already tried with success at Bordeaux and in a few other towns, and was examined by a competent jury at the Exhibition of the Industrial Arts, 1879, when an honourable mention was accorded to M. Combe d'Alma, the inventor. M. Charles Garnier, the architect of the Opera House, was a member of the jury on this occasion, and was so favourably impressed with the process as to have granted permission to the inventor to carry out a practical demonstration of his system at the Opera, with a view to attract public attention to it. The inventor claims for his cork gas that it is rich and quite inoffensive, there being no sulphurous compounds mingled with it. It is also produced very readily, and does not require a high heat for its evolution. The material used is capable of yielding a minimum of 500 cubic metres (17,650 cubic feet) per 1000 kilograms (2204 lbs.). The light is said to be more brilliant than that of the best coal gas; and the residual products of carbonization are expected to prove highly valuable. The raw material is said to be easily obtainable in any required quantity, and at a sufficiently low price; but no statistics on this head, or working statements are given by the inventor. Our French contemporary, *Le Gaz*, from which this account is extracted, states that M. Emile Durand has inspected the new gas, and bears willing testimony to its brilliancy, which, however, he describes as far from equal in illuminating power to Boghead canal gas. Passing over, somewhat contemptuously, the inventor's remarks concerning the purity of the cork gas, M. Durand states that he has had no opportunity of seeing any of the valuable residuals above mentioned, except the coke from the retort, and this was extremely light and friable, needing compression before it could be used. The cork yields about 20 per cent. of this coke. With regard to the cost of the raw material, M. Durand is sceptical as to the possibility of obtaining a constant supply of old bottle corks, cork parings, &c., sufficient for the supply of the gas-works of Paris alone, or if this be overcome, he considers that the care with which every scrap of cork is picked up by the *chiffonniers* of Paris indicates the existence of a market for old corks which would be seriously interfered with by any great demand for the purpose of gas-making, the inevitable result being, of course, a great increase in the value of the material.

INCrustATIONS IN STEAM BOILERS.

According to Mr. W. Ivison Macadam, F.C.S., the formation of scale in steam boilers is dependent solely on the composition of the water used. After much experience in the use of various materials employed as anti-incrustators, in the course of which he repeatedly analyzed the scale or incrustation formed with or without the previous introduction of the substances intended to prevent fouling, he is inclined to assert that in most cases the water ought to be treated for the prevention of scale before it is admitted into the boiler. Water used for the production of steam is frequently hard, and to this fact rapid incrustation is mostly due. Mr. Macadam advises that water containing much carbonate, or temporarily hard, should be softened by Clark's process, and that water containing sulphates, or permanently hard, should be treated with common soda, which will remove the greater part of the lime salts. If this is done, Mr. Macadam thinks the water will not be likely to cause much corrosion in any boiler, but any deposit may thereafter be easily kept in a soft mass, susceptible of easy removal, by the addition of a pint of paraffin to the feed water about once a week. The action of the paraffin is to coat the particles of sediment, forming them into minute balls or pellets which do not readily adhere to each other. No tallow or other fatty matter should be mixed with the paraffin, and exhaust steam should never be condensed for use with the feed, if it is at all oily from any other source than paraffin lubrication. The waste steam may, however, be used with advantage to help, by heat, Clark's or the soda process of softening the water. Mr. Macadam strenuously objects to the introduction into boilers of tallow in any form, as it is liable to form an insoluble lime soap by combination with the lime salts, and this compound adheres to the plates, and permits of their becoming overheated. From its safety in application and its cheapness, Mr. Macadam relies much on paraffin, and advises that boilers when empty should be coated inside with this material; but it must in all cases be used as pure—i.e., as free from fatty contamination—as possible.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE ECONOMY OF CARBONIZATION.

SIR,—It has been stated that once upon a time an ancient King was possessed of a number of very obsequious courtiers, who tried, as he thought, to outvie each other in how they could serve his Majesty; when, turning round on them one day, he said: "For all you try, there is not one of you who can scratch me on the precise spot where it itches."

I have little as did that ancient Monarch, while I have been reading the numerous (and some of them) able letters of your correspondents, on the question of high yields of gas per ton of coal carbonized. The first, in your issue of Oct. 12, from the pen of Mr. G. Livesey—the week after my communication on the same subject appeared in the JOURNAL (see p. 529)—and the last from Mr. R. H. Jones, of Dover, on the 16th inst.

One of your correspondents talked of "managers who are beguiled by the 'honest triflers' of excelling in the retort-house," where they believed that dividends are made; but he has fallen out with such notions years ago. He no longer "dances his pats over the furnaces," but now looks more to trying the cheapest coal he can get. May Time lay his hand gently on this correspondent's frontal bone, say I; for the man who hopes to earn a reputation in gas-making by buying cheap coal, is likely to have a future before him that will insert wrinkles in the brow of the most happily constituted.

Other gentlemen introduced the subject of high heats; and the policy of obtaining more gas by this means has, in my opinion, been successfully condemned. Also it has been discussed by others whether commercially it were not better to have a moderate yield of good gas and a larger yield of tar.

All these are interesting subjects in themselves, and the answers will be various according to the varied local circumstances of those who consider them; but none of these touch "the precise spot where it itches."

In my communication published on Oct. 5, I stated that from retorts 8 ft. 6 in. long and 10 in. by 12 in. in section—charged every three hours with about 1 cwt. of coal each—4754 feet of gas were made per day, and 11,502 feet per ton of coal carbonized; that the heats were moderate, and the illuminating power of the gas not reduced. It was not stated then—so I may mention it now—that the coal was Ravensworth Pelaw, and that with larger retorts, larger charges, and worked six hours, the yield has been 9800 to 10,000 feet per ton; and it is the contrast between large retorts and high charges of long duration, and small retorts and light and short charges, to which your readers attention was drawn.

Mr. Livesey, in the first of three letters that he has favoured us with (and I trust we shall always have occasion to appreciate what comes from his pen), asks the rather astounding question, "Is a High Make of Gas per Ton an Infallible Test of Good Management?" Mr. H. E. Jones the next week answered him, that it is a rough-and-ready test of good management; and I agree with him thus far. Certainly a low yield would not, I think, be considered a good test, and if not the opposite should.

But I question the scientific propriety of the question as put. No prudent man would pretend to give an infallible answer on a moot point in any manufacture. Indeed, I have only heard of one man on earth who pretends to infallibility, and he, so far as I know, is not a gas engineer. The answer to Mr. Livesey's question as put must, therefore, be in the negative.

The question which I intended to put before your readers was one which each could answer according to the conditions in which he was placed. Many a manager cannot find a sale for tar. In his case the more gas and the less tar, the better for him. On the other hand, many find coke a drug; and if one did burn a little more coke while getting more gas, it might be the more economical procedure. Some there are who get a very high price for tar, with whom it might be different; and to them it might be an interesting question how little gas they could make while getting a large yield of tar; and they might perhaps be able to adopt the compound and euphonic title of "Tar and Gas Engineer." I had also in my mind—and wished it to arise in the minds of others—whether large retorts, and six-hour charges, so universally adopted by "those who ought to know," is a mode worthy of our unquestioned acceptance as gas makers. I shall be glad to take the negative of such proposition; and, although it is not usual for the negative to open a debate, this would be one in which the negative would affirm a contrary doctrine. The following affirmations can be made.

First. I know that in the usual six-hour heavy charge the gas is extracted from the exterior of the charge from one to two hours before the charge is carbonized thoroughly to the centre. I have frequently seen in the centre of a charge a dark core of coal which flamed when struck by the rake, while all the outside was well carbonized. Hence it is evident that the large retort is doing very little for an hour or two, every charge waiting for this small core to be burnt off.

Second. When a large charge is put into a retort, and more especially when the plan is adopted of drawing and charging a whole setting at a time—the retort is so cooled down that much tar is made for the first hour, and very little gas in proportion. This I proved 20 years ago by charging a whole setting and taking the index of the station-meter every quarter of an hour throughout the charge.

Third. By charges of three or four hours duration, and making a "draw" to consist of retorts spread over a number of benches—say two in each instead of six in one—I shall get a more uniform heat in the retort, which will tend to increase its life.

Fourth. I think there is *prima facie* evidence that by thinner and quicker charges you will make better gas and extract less sulphur from the coke. With short charges the heat of the retort is more uniform throughout the whole period; with long charges the heat of the retort increases much towards the end. From the fact that it is making very little gas during this time, the heat increases, and you are extracting sulphur from the exterior of the charge whence the gas has been all

obtained a couple of hours before; in this way deteriorating your gas, burdening your purifiers, wasting your fuel, and also making less gas per retort as well as per retort-house.

These, I submit, are all questions of practical value. They are questions which many a man can solve without any expense for apparatus, and they are questions—judging from the many letters which have already appeared in the JOURNAL—upon which more information is wanted.

I beg to congratulate the profession on Mr. Livesey's kind offer to publish results of experiments on the foregoing. Possessed of the advantages he has, they will form a chapter in the exact science of gas-lighting; and it will not be the first occasion on which he has given useful practical information in a straightforward, plain manner.

GEORGE ANDERSON.

35A, Great George Street, Westminster, Nov. 19, 1880.

Sir,—I am obliged to Mr. R. H. Jones for pointing out some inaccuracies in my article published in the JOURNAL of the 9th inst. I regret that in the hurry to send the article off I neglected to check the figures.

I cannot agree with Mr. Jones that the increased heat of the retorts, and the consequent shortening of the charges, can only be accomplished by an increase of 25 per cent. in the fuel account. The 15 cwt. which I allowed for each furnace is equal to 20 per cent. of the weight of the coal carbonized, and I know a gas-works in this country where, at the present time, more coal is carbonized, and more gas made per mouth-piece per diem, than I have allowed in my estimate, with an expenditure of 20 per cent. of fuel. The estimate was not intended to represent what would occur, supposing, with the same plant, the heats were raised by "hard firing," as Mr. Livesey has expressed it; but the improvement that can be attained by the use of improved furnaces and other carbonizing apparatus. If any addition is required to the fuel account, it should be made to Estimate No. 1, in which I consider it was placed exceptionally low.

In regard to labour, my estimate corresponds with Mr. Livesey's allowance of 2d. per ton. Four-hour charges might necessitate three shifts of stokers, where the labour is all by hand; but with the use of such drawing and charging machinery as is now successfully applied, three shifts are not required.

The interest on capital was placed at 10 per cent. by Mr. Livesey, and there are provincial companies who, when requiring additional capital, still issue, at par, 10 per cent. shares *pro rata* amongst their shareholders.

The increased productive capacity of the retorts I placed at 20 per cent.; but it should have been 30 per cent. to correspond with the estimate. This is in favour of my argument, and is sufficient to leave a margin for unproductive capital.

G. ERNEST STEVENSON.

Peterborough, Nov. 18, 1880.

P.S.—In regard to wear and tear, I again refer to the regenerative systems on the Continent, in which high heats are maintained without shortening the life of the retorts, and without increased expense in repairing furnaces.

G. E. S.

THE AITKEN AND YOUNG ANALYZER.

Sir,—In reply to a letter published in last JOURNAL from "An Old Subscriber," respecting Messrs. Aitken and Young's analyzer, and in which I am referred to, I have to say that I am not aware of any "flaming" report respecting the analyzer. There was a statement of facts published, giving the results of certain testings made by a Committee of the United Kingdom Gas Managers Association; but I do not think that it need be called "flaming."

The object of the analyzer is to utilize, in enriching the gas, the naphthas which, in the ordinary process of condensation, are removed with the tar; and to meet which, it is necessary to use an excess proportion of first-class cannels.

I have not fitted up an analyzer on these works, because I distil my tar, and so recover the excess naphthas removed with the tar. The value of the recovered naphthas reduces my coal expenditure to a point that makes the advantages to be obtained by using an analyzer of little importance. If, however, I did not distil my tar, then—rather than had over the naphthas with the tar to a tar distiller—I would prefer to use an analyzer.

I may remark that possibly the reason why the analyzer is not generally adopted may be, first, because gas managers have not given the apparatus sufficient study to understand it; secondly, where they do understand it they are afraid it will require more of their personal attention to work it than they can afford to give; and, thirdly, in the annual fluctuations of the coal market it might possibly be found, from the increased market price of coal, that the item of outlay for coals was as high after introducing an analyzer as before, and as the effect of the small little of the coal market, and not considering the coal account would have been very much higher but for the use of an analyzer, they might blame their gas manager for having led them into an expenditure of which they could not see the advantage.

There is very little doubt, however, that should any serious advance take place in the price of cannels—especially first-class cannels—not only will the analyzer receive more consideration, but also many other inventions which in the meantime are not even looked at.

Greenock Gas-Works, Nov. 18, 1880.

S. STEWART.

Sir,—In your issue of the 9th inst. your Edinburgh correspondent devotes a considerable portion of space to the discussion of gas matters in our burgh, in which our "hazy conceptions" of the "meaning of the progress," and our "knocking down and scattering to the four winds apparatus ancient and modern" are referred to. We are also accused of "rejecting a certain piece of apparatus the working of which has been proved to effect a considerable saving in the make of gas," in throwing out Messrs. Aitken and Young's analyzer, the beneficial results of which had been testified to by such men as Mr. Stewart, Manager of the Greenock Corporation Gas-Works, and others. Will your correspondent kindly inform the world how many of those gentlemen who uphold Messrs. Aitken and Young's patent have introduced

this admirable apparatus into their own works? Or how many of them were personally interested in the sale of the apparatus of the Directors of the Company? Your correspondent upholds Mr. Tainsh in pointing to the miserable pittance given to our former Manager. Is he aware that Mr. Tainsh was a prominent party in fixing his salary? And if Mr. Tainsh does not insinuate that the present Manager is paid too much, how is it that he has at this moment notice of motion on the table for an inquiry into all salaries, with a view, I presume, to reduction, so as to effect a saving for the community?

Your correspondent also refers to the parties who have "donned their war paint" entering the list with the publication of figures—the one showing a profit of upwards of £700, the other a loss of near £300. I enclose result of a meeting of the Hamilton Town Council on the subject, also a test balance-sheet, which speaks for itself.

ANDREW CASSELL,
Convener of the Gas Committee.

Hamilton, Nov. 12, 1880.

[The above letter, which was received too late to be dealt with in last week's issue, is referred to in another column by our Edinburgh correspondent.—Ed. J. G. L.]

DR. ADAMS'S GAS STOVES.

Sir,—My attention has been called to a report on Dr. Adams's gas heating stoves, in which it is stated that each cubic foot of gas consumed utilized 51,300 units of heat. The unit of heat referred to is not the ordinary standard unit—viz., the quantity of heat required to raise 1 lb. of water 1° Fahr., but is defined to be the quantity of heat necessary to raise 1 cubic foot of air 1° Fahr. Now, since 1 lb. of air at 62° contains 13.156 cubic feet, and since the specific heat of air is only 0.237 as compared with that of water, it follows that the standard thermal unit contains (13.156 ÷ 0.237) 55.5 of the new units now proposed.

The report of Dr. Adams and Mr. J. L. Bruce states that 51,300 of these new units of heat were utilized for each cubic foot of gas. Dividing by 55.5, as explained above, there would therefore have been usefully given out 924 of the ordinary units. Besides this, we must allow for the heat escaping by the flue, which is necessary to maintain the draught through the various passages of the stove, and to carry off in vapour the water produced in the combustion. The temperature in the flue must be considerable, as I do not see that any provision is made for the water which would be deposited if the heat were not maintained above the point at which condensation takes place. If we allow 20 per cent. for the heat so escaping, we should then have (924 + 184 =) 1108 thermal units given off by the combustion of 1 cubic foot of gas—a quantity which experience has shown to be all that can be expected. The total heat of combustion of coal gas has been generally considered to be only about 700 units, and, unless there is something exceptional in the gas employed in Glasgow I am at a loss to account for the extraordinary results attributed to the new stove, which by Dr. Adams's own statement "gives from 8 to 16 times as much useful effect as any stove hitherto made." Surely the old makers must have been very much in the dark, or else a very wonderful discovery has been made by the inventor of the new stove.

It is also claimed for this stove that by it a large portion of heat is made radiant instead of being converted. As this change takes place in a chamber which is separated by metallic partitions from the air to be warmed, I cannot see how it makes the slightest difference whether the heat within the chamber be radiant or non-radiant. The external air is heated by the metallic surfaces only, and it makes no difference what the source of heat is which warms them. The only thing to be considered is the temperature which they reach. If this be too high, the air becomes burnt, as was pointed out by Dr. Arnott half a century ago. If we place before an ordinary coal fire, burning in a grate, a sheet of iron intercepting the heat rays, the grate is converted into a stove; all the heat reaches the room either by convection or that low order of radiation which all stoves employ. If the heated gas tubes in Dr. Adams's stoves were visible, the result would be different.

In making these observations, I do not by any means desire to depreciate the apparatus, which I think has some good points, but it is better that it should be tested by principles which are sound, and judged on its own merits, rather than on statements of economy which are certainly exaggerated.

In the last number of *Nature* will be found a letter from Dr. Siemens, describing a combined gas and coke fire he has invented, which, if I mistake not, solves the question so long discussed—how to use gas as a substitute for coal fires. Dr. Siemens, with that generosity which is one of his characteristics (and which, I am sorry to say, has not been imitated by those who have imitated his inventions), has placed this system at the disposal of the public, reserving no rights for himself.

Cork, Nov. 17, 1880.

DENNY LANE.

[Dr. Siemens's letter to *Nature*, to which our correspondent directs attention, is referred to in our "Notes" column to-day.—Ed. J. G. L.]

ASCERTAINING THE CONSUMPTION OF GAS IN STREET-LAMPS.—In regard to the paper read by Mr. D. Bruce Peebles before the recent meeting of the West of Scotland Gas Managers' Association, and published in last week's JOURNAL, Mr. W. Key, of the Tradeston Gas-Works, Glasgow, writes that as far back as 1876 he suggested, in our pages, such an arrangement as Mr. Peebles has now carried out. The communication to which Mr. Key refers will be found in Vol. XXVII., p. 195, where after pointing out the necessity then existing for a governor that would "pass the exact number of feet per hour it is made and given out for," our correspondent added: "Then in place of average meters I will only have one or two 'average clocks,' with dials of tens, hundreds, and thousands of hours, to be set in motion by touching a small lever in conjunction with that on the lamp when lit, and turned off in the same way when its lamp is put out. Thus the hours on will be registered, and the number of governors will give the exact number of feet consumed per hour, and neither wet nor dry meters will any longer be to blame."

MR. BARCLAY HENDERSON, who has occupied the position of Engineer to the Edinburgh Gaslight Company for the past 30 years, has just retired in consequence of failing health.

tended that the general word "tenements" was to be confined to "void spaces of ground," and not to include spaces of ground beneficially occupied and not void?

Justice FIELD: What is the meaning of "void"?

Mr. POLAND: Unoccupied.

Justice FIELD: All land is occupied by somebody.

Mr. POLAND: It may be possessed, but if it is allowed to run waste, it is unoccupied land.

Justice FIELD: There is no such thing as unoccupied land known in the law.

Mr. POLAND said the assessment of void land was to be on the number of square yards. It had no annual value, but nevertheless it was to be rated upon the number of square yards, as mentioned in the Act.

Justice FIELD: Do you propose to rate these pipes and mains according to the area?

Mr. POLAND: No; according to the annual value.

Justice FIELD: Then you say that this is occupied ground—it is not a void space?

Mr. POLAND: It is a space of ground not void, but beneficially occupied, and is to be rated in the same way that any other tenement is to be rated under the Metropolitan Local Management Act.

Justice FIELD: You say that inasmuch as a void space of ground is liable to be rated—that is, by reason of its being a tenement; then you say that inasmuch as the peculiar mode of rating is only applicable to a void space of ground, this land does not fall within the description, but still remains a "tenement" within the meaning of the statute—it is a full space of ground.

Mr. POLAND said that but for the exemption in the Metropolitan Local Management Act it would be rated in the ordinary way. He then proceeded to contend that the word "tenements" could not be tied down by the principle that where it followed the words "houses and buildings," and so on, it must be considered *ejusdem generis*. The cases referred to decided that although land occupied by mains and pipes would be included in the definition "tenements or hereditaments," yet that those words following "houses, buildings," and so on, were to be construed as meaning only tenements and hereditaments of the same class and character. This could not be so in the present case, because some land was included, and if some land was included with the word "tenement" have given to it, in construing this Act of Parliament, its legal meaning? It was a well-known legal term, and did include land occupied as this land was.

Justice FIELD: How do you define the word "tenement" as used in this Act?

Mr. POLAND: I should say it includes all houses and buildings.

Justice FIELD: They are specifically mentioned.

Mr. POLAND said it also included land. In the case cited it seemed to have been conceded that the land was included in the word "tenement," and there was nothing to control the meaning of the word; and here they had the further matter that the Legislature had used the word "tenement," clearly did include void land, *a fortiori*, land beneficially occupied. The Shrewsbury case referred to was a strong authority to show that in constraining these Acts of Parliament "tenement" must have its ordinary legal meaning; for unless it laid, so as to include beneficially occupied "spaces of ground," the absurdity would arise that it included a void space of ground, and not a beneficially occupied space. Was it meant to exclude a tramway, an open canal carrying water, or pipes upon arches in the nature of an aqueduct?

Justice FIELD: A tramway is rateable because it occupies a certain portion of the soil. You say if it decide this in favour of the appellants we shall be called upon to-morrow to say that tramway companies are only to pay according to the area occupied.

Mr. POLAND: And if the tramway was not on the street itself, but on the side of the street, or a railway running along at the edge of the street and forming one of its boundaries, it could only be rated under the word "tenement."

Justice FIELD: You say it cannot mean void merely of buildings?

Mr. POLAND said void of anything, "void" or "vacant" meaning much the same thing. The words "tenement" were read in its ordinary legal sense, the New River Company were liable to be rated at the lighting rate because they were liable to be rated to the lighting rate at the time the Metropolitan Local Management Act was passed. The point was a very narrow one, and there was no difficulty with regard to the cases. He contended that what was put in any way trenching upon the cases referred to, the word "tenement" should be construed to include the land occupied by the mains and pipes of the Company, and as the ordinary beneficial value as they would have been rated under the Metropolitan Local Management Act if there was no special exemption; because now the lighting and paving rates were made upon the basis of the poor rate.

Justice FIELD said no doubt if this construction was possible it was a very beneficial one, because it was certainly rather inconvenient that the Company should pay rates in one district and not in another; and, besides, it was a complete non-observance of the principle that every occupier should pay according to value.

Mr. POLAND said that though the Acts on which the appellants admitted that they were rateable were separate documents, and did not touch the question legally, still there was this to be said, that it would be a very strange thing for one estate to be rated upon one principle and another upon another. Possibly the difference in the language arose from the fact that different Parliamentary drafts drew the Acts. In the case of as to the Crown Estate Act, he admitted that the word "tenement" if it stood alone would not include this land. The rating clause, however, used the words "spaces of ground." The land occupied by the mains and pipes was a "space of ground." It was ground, and that was a "space of ground" measured by the size of the area. In the case of *Regina v. West Middlesex Water-Works* (28th Lane Justice, *Magistrates Case*, 185) Justice Wightman, in delivering judgment, said: "In this case the first question is whether the Company are rateable for their mains, which are laid under the surface of the highway without any freehold or leasehold interest in the surface being reserved to the Company. I think they are. The mains are fixed capital vested in land. The Company have possession of the mains buried in the soil, and so, *de facto*, in possession of the space in the soil which the mains fill for a purpose beneficial to itself. The decisions are uniform in holding that gas companies are rateable in respect to their mains, although the occupation of such space is not a freehold, and that the mains, if they are not buried in the land where the mains lie, by force of such statute." In ordinary language, what was the difference between a pipe resting on the surface, or a canal, or an aqueduct, and a pipe in the ground? and "spaces of ground" was reserved to the Crown Estate Act. He contended that this was abutting upon or fronting the street." This not being a "space of ground," was a "space of ground," and if a space of ground, why not within the rating clause? If so, the Acts were rendered consistent, and the advantages derived from the paving, lighting, and cleansing of the streets would be paid for by persons holding property situated upon or abutting upon the streets.

Justice FIELD: I suppose you say that during the winter months the

Company are glad of the gaslight to repair their pipes by. I believe they generally repair them in the night-time.

Mr. POLAND said this was so, and besides, having a properly paved hard surface prevented the pipes being crushed. The salient point of the case, however, was that *a fortiori* a space of ground beneficially occupied by this was should contribute something if void spaces were to contribute. If he was right in this, those sets of Acts would be consistent with the other Acts which were not in dispute in the case. The last case was as to the word "ground." The word "gardens" was mentioned, so "grounds" must have some other meaning than "gardens." It was the first word in the charging clause. Was this an unlawful expression for "lands," or did it mean something which it was difficult to define? He should submit that "grounds" was used instead of "lands," coming as it did before the word "houses." The word "lands" was occupied by these mains and pipes. It was not "garden ground," it was not "yards." It would include all other grounds, even an arable field, if there was such a thing in the parish of St. Pancras. It referred to all "ground" which was rateable upon the general principles of law, whatever those general principles might be, and must include the land occupied by the pipes and mains of the Company. Those were the reasons upon which, on the part of the parish, he contended that they had come to a right conclusion that the Company was liable to be rated under the Metropolitan Local Management Act, as well as under the others as to which they admitted their liability.

Mr. WEBSTER having replied,

Justice FIELD said, looking at the importance of the principle involved, and the number of Acts of Parliament to be interpreted, although the Court had not much doubt as to what their judgment would be, it was necessary to put it into proper shape, and therefore it would be deferred till a future day.

THAMES POLICE COURT.—TUESDAY, NOV. 9.

(Before Mr. SAUNDERS.)

KNIGHT (ON BEHALF OF THE METROPOLITAN LOCAL MANAGEMENT ACT) v. THE GASLIGHT AND COKE COMPANY.

This was a case in which the Chartered Gas Company were summoned for not having repaired the Canal Road, E., to the satisfaction of the Surveyor of the Vestry of Mile End Old Town.

Mr. JUTSUM appeared for the complainants, and Mr. BESLEY for the defendants.

Mr. BESLEY raised a preliminary objection to the case being proceeded with, on the ground that the summons was taken out in the name of a private individual instead of in the name of the Vestry; but after a short conversation the objection was withdrawn, in that parish there was a certain

Mr. JUTSUM, in opening the case, said the sole question was one of fact, and related to the reinstatement of a road.

Mr. BESLEY said he should have to raise several questions of law as well as of fact.

Mr. JUTSUM said that, having regard to a conversation which took place on the previous day in the office of the Solicitors to the Company, when the only point considered was whether the work had been done to the satisfaction of the Surveyor for the time being of the Vestry, he was not prepared to argue the question of law, and must therefore ask for an adjournment.

The MAGISTRATE: If those questions do not arise, there will be no necessity to deal with them. We cannot tell, of course, what you will have to deal with until the questions are raised against you.

Mr. JUTSUM said the facts of the case were as follows:—The Vestry of Mile End was one of the Vestries mentioned in the schedule to the Metropolitan Local Management Act, and in that parish there was a certain macadamized road, called Canal Road, beneath which the mains of The Gaslight and Coke Company were laid. Under the powers of the Act mentioned, the Company were authorized to make openings for the purpose of laying down or repairing those mains, but they were also required to reinstate the road to the satisfaction of the Surveyor. The Company, and informed them that the work was not being done to his satisfaction or to the satisfaction of his Board, and he made certain requirements. The Canal Road was a macadamized road, prepared by means of a steam roller, and not one on which macadam had been put down. When asked to be better acquainted with the road, the Surveyor likewise required that the work should be done with concrete, the reason being that if a hole was filled with loose material, however well it might be put down, the same quantity of stuff that had been taken out of a hole could not be got into it again. The Surveyor also asked that concrete should be laid for a certain distance on each side of the gas-main, and an extra piece cut out, so as to form a sort of slab for the roadway, so that when the concrete hardened, the part immediately over the hole should not sink. The Company considered that what they had done was sufficient within the terms of the Act; but the Vestry contended that the Company had not done what was required, and that the work done what they were required to do—that the road was not properly concreted in the way in which it was before their operations—which could only be done by means of a steam or other heavy roller. The Vestry did not ask for a steam roller, but if it was a roller of an equally heavy kind, it would be better to be better acquainted with the road, the Surveyor was perfectly satisfied. One great question was that of cost. A road made by a steam roller was, of course, of a much more lasting character than one which had to be ground down by means of the traffic before it arrived at a tolerably level surface. So far as he (Mr. Jutsum) had been able to judge from the conversation between the parties, the use of the steam roller and of concrete was the sole matter in dispute; and the evidence he should produce would show that, in order to meet the requirements of the Act, it was one of the requisites that this plan should be carried out.

The MAGISTRATE said that what he actually been done by the Company.

Mr. JUTSUM said they had only filled in the stuff which had been taken out of the road, and rammed it down in the ordinary way, but he did not believe they had put any macadam in.

Mr. Knight (plaintiff): Yes; they have done that.

The MAGISTRATE said he believed it was the common practice throughout the Metropolitan for the Gas Companies to give vouchers guaranteeing to further reinstate the road if anything particular happened. This matter had been carefully considered, and the conclusion arrived at was that the only way to secure the road being put into a proper condition was to have the road laid down in the first instance, either by a steam or other heavy roller; because in the case of *Hyams v. Webster*, tried not only before the Court of Queen's Bench, but also in the Exchequer Chamber, it was decided that after a road had been once properly reinstated, the Company or person opening it had no further power to do anything with it.

Mr. Knight said he was satisfied, to the contrary, to the contrary. He contended it decided that where work had been done within the three

months, and the twelve months provided for in the Gas-Works Clauses Act, he not shaped if there was any negligence in the reinstating, the gas company were liable.

Mr. JUTSUM said the case went to this extent, that the obligation of the defendant, as between him and the public, ceased as soon as he had properly reinstated the road, and that the parish authorities had to look after subsequent repairs. It might be very expensive, but it was quite possible where an enormous number of openings were made in the roads—there being some miles of them—to see that they were reinstated in the best possible way, so that there might be no subsidence, and that the parish would not have to bear any expense. The summons in the present case had only gone as far as the macadamized part. The Company had opened a large part of the Mile End Road, but he (Mr. Jutsum) did not think the Magistrate would be troubled with this, because there the Company had consented to put in the concrete required by the Surveyor, but in the Canal Road they declined to do so.

Mr. BESLEY said that if the form of the summons were looked at it would be found that the Company were summoned simply as to the Canal Road, and that they did not, with due diligence, cause the surface of that road to be made good in a proper and substantial manner. His friend altogether overlooked the fact that besides the Metropolitan Local Management Act, The Gaslight and Coke Company were under the provisions of the Gas-Works Clauses Act, which it would be found that it was quite impossible for proceedings to be taken until twelve months had elapsed from the time of the opening of a road. [The learned Counsel read the 10th section of the Act.] Reading the two sections together, it would be seen that if there were any delay in filling in a hole so as to make the roadway trafficable, the Company would be liable for not doing it; and if in the course of the year it got out of repair, the Vestry might send to the Company, every week if they chose, to have it again put in repair. Even after the twelve months, if the road should subside, the Company were liable to repair and put it in good condition.

The Magistrate then seemed somewhat at variance with those in the Metropolitan Local Management Amendment Act.

Mr. BESLEY said he thought not. The Gas-Works Clauses Act applied to gas companies all over the kingdom, and imposed a much higher penalty upon them in requiring them to repair and make good all streets and open spaces of which they were the owners, than was imposed by the Metropolitan Local Management Amendment Act. At the time when the Gas Company's liability was about to cease, there was still a subsidence, then the Metropolitan Local Management Act would come into operation, if the work was not in accordance with the provisions of the Act or to the satisfaction of the Surveyor. The plaintiff said that it had happened in the case of the Metropolitan Local Management Act, and that the road in accordance with the Metropolitan Local Management Act; and if this was the case the Vestry might call upon the Company to do so; but the proof was whether the road lasted for twelve months without want of repair and without subsidence.

Mr. BESLEY said the Company may not want repair, although they may not be in the same condition though they were before they were broken up.

Mr. BESLEY: But we are simply here for that. It is a mistake to suppose that the Vestry have any freehold right in the soil.

Mr. JUTSUM: I undertake to say they have.

Mr. BESLEY said they had a right to the surface of the street and the carrying on of the traffic, but they had no right to the soil, as to which the recent case of *Jacob v. Chilton and Another* was conclusive. In macadamized roads it might well be that the Company were right, and that a steam roller was a most objectionable thing. There had been an accident at Brighton, where a gas-pipe had been broken by a steam roller.

The Magistrate: At all events the road must be put into the same condition as it was by the action of the steam roller.

Mr. JUTSUM: That is all we want.

Mr. BESLEY said he believed the steam roller had put the Company to an expense of £400. The Vestry utterly refused to lay down concrete. What right had the plaintiffs to ask for concrete? There was none before.

The Magistrate: The question is whether you have produced a similar roadway to the one that was there before you broke it up.

Mr. BESLEY said the summons also stated that the Company had been guilty of injury and of providing the road in a defective condition.

Mr. JUTSUM: I beg your pardon. I do not say anything of the kind in the summons.

Mr. BESLEY: The summons says, "And did not with due diligence cause the surface of the road broken up to be made good," and so on.

Mr. JUTSUM: That is what the case is about to prove.

Mr. BESLEY: I do not know about that; but at all events they make a statement to you that the concrete is not there.

The Magistrate: It does not much matter, so far as the parties here are concerned, how the surface is made good, so long as it is made good.

Mr. JUTSUM said the only point in dispute was whether the surface was made good in a proper and substantial manner. In a case concerning the East London Water Company, Mr. Paget thought it would be more convenient if he went and judged for himself; and he (Mr. Jutsum) did not know whether he might request his Worship to do the same.

Mr. BESLEY said he did not desire to be interrupted by any other case. They would have the evidence, and nothing else.

Mr. Besley handed in a plan of the locality, and the following evidence was then called for the plaintiffs:—

Mr. John M. Knight, examined by Mr. JUTSUM, said he was Chief Surveyor to the Vestry of Mile End, and had been so for 14 years.

It was a part of his duty to receive notice of openings in the roads. In September last he received a notice [produced from The Gaslight and Coke Company] that they had opened a road. While the work was proceeding, he complained that the filling up of the trenches was not such as made the road safe for traffic, and in the places where it was in before. The road was formed of a concrete material which had been made by condensing layers of broken Cornish granite placed one upon another, and the whole at last had been finished by a steam roller. The Company, in lieu of keeping separate and apart the granite which came from the surface of the road, had put it in the places where it was in before.

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By the Magistrate: The general size of the openings was 6 feet in

length and 4 feet in width. There were a very large number of them, and they were with a few feet of each other along the whole length of the road, which was about 600 yards long.

In cross-examination by Mr. BESLEY, witness pointed out on the map the position of Canal Road, and marked the portion of the road of which he complained. His definition of concrete was that it would mean a material of which it was made a difference, or is your complaint that the Company have taken away part of the materials of which it is formed?—I say the Company have not put back the actual materials, or bound and ground the concrete together.

Mr. BESLEY: Look at the words, "With the same or a similar material of like quality and thickness." What materials are absent from this road which were there before?

Witness: The granite.

You mean to say that the granite has been taken away?—I mean to say that the granite is not where it was before.

I want to know what you charge us with having been deficient in putting on the road?—Before you came there was a thickness of macadam equal to the thickness of this rule [holding up same], which had been ground down to form a hard and concrete substance. You have taken that away, and put in nothing but the ordinary earth.

I want to know your meaning. Is it that merely taking up the concrete and putting in the same material, but not the same quality, is your complaint that the Company have taken away part of the materials of which it is formed?—I say the Company have not put back the actual materials, or bound and ground the concrete together.

What materials do you charge the Company with taking away?—I will not say that they have put in anything, but I say they have put in the granite into the bottom of the hole instead of putting it in the same place in which it was before they opened the road.

Cross-examination continued: The road was repaired by the Vestry during the summer, when the steam roller was used. Witness' attention was drawn to the fact that the Gas Company had a steam roller at their disposal by the steam roller. He was aware that such a thing had happened at Brighton, and that the Town Council had to bear the expense of the damage caused by an explosion. In spite of this he still continued to use the steam roller, because he had not broken any pipes.

Mr. BESLEY: But if you displace the sockets, and cause a leakage, how then?

Witness: But I have not.

The Magistrate: Of course the steam roller forces all this under the surface?

Mr. BESLEY: Yes. If there is any concrete, it will carry a steam roller or a traction engine, or anything of that kind; but if there is no such substance, there is a liability that one of the gas-pipes might be broken, and therefore there is a necessity to have the road made in the same substantial way that it was before.

Mr. JUTSUM (in re-examination): You do not claim against the Company that they have put in the granite at the bottom and something soft at the top, but you say all the materials became mixed up together?

Mr. BESLEY: I do not know what you are leading the witness up to. If you are going to withdraw his statements, do not put it in a leading form.

Witness: I say the material is not put in in the same order or in the same layers. It might have been put in a considerably better than it is without making the roadway as good as it was before.

The Magistrate: It may be necessary to keep everything separate to consolidate materials; and, in order to consolidate them, it may be necessary also to put in other materials.

Mr. BESLEY: The statute does not compel us to put in other materials.

Mr. Francis Wootton, examined by Mr. JUTSUM, said he was the Engineer of the East London Railway Company, and had had a great deal to do in the way of reinstating roads in seven or eight different parishes during the construction of the East London Railway, the main portion of which was in the neighbourhood. He had inspected the Canal Road, and found the macadam which had been on the top was mixed with all kind of refuse and mud, and so did not form a species of concrete surface like the remainder of the road. In some places he could kick a lot of the soil out with the toe of his shoe, and with the heel.

Mr. BESLEY: The witness said the road was filled up with materials of the same strength as if the road had been formed by a steam roller?

Witness: Certainly not. The reason is that when the steam roller is used, the ground is also sprinkled, and all the interstices between the large stones are filled with smaller material, so that a water-tight surface is obtained. When the stones are laid in the other way, and are allowed to sink down in the earth by means of passing traffic, you have a mixture of mud and stone, which is nothing like water-tight; and it is just this water and mud mixture which does all the damage to the road.

In connection with the works with which you have been connected, what was the usual method adopted there?

Mr. BESLEY objected. He said he did not care how witness carried on his work.

The Magistrate: We have to deal with the result; never mind how it is produced.

Mr. BESLEY: Did you see the road before it was opened by the Gas Company?

Witness: I have seen the surrounding portions.

The Magistrate: You have only seen what there is now?

Witness: That is all.

Mr. JUTSUM, on behalf of the defendants, said the only way to approach the question was to see what was the legislation contained in the Gas-Works Clauses Act. The Act distinctly provided that during the first three months after the reinstating of a road, it should be re-opened as often as was requisite, and if after twelve months it was a nuisance, the Company was liable for twelve months to remedy such subsidence; and that was a provision which the Magistrate was asked absolutely to repeal. He (the Magistrate) was also asked to permit these proceedings to take place when there was no evidence of anything having been done different from what had been done in the case of the other gas-pipes.

Mr. BESLEY (Mr. Besley) pressed this matter was that the Vestry had power by the Metropolitan Local Management Act to do the work themselves, and then apply to the Magistrate or to the Superior Courts for an order to make the Company pay the expenses. The Company did not desire to shirk any responsibility at all, but were anxious to have brought a practical issue the question whether they were to be subjected to this kind of procedure for the purpose of carrying out the whims and oddities of vestry surveyors. He said "whims and oddities" advisedly, because if the evidence conveyed to the mind of the Magistrate that mud and refuse and slush had been put into the road, this would be absolutely untrue, and evidence could be called on the point.

The Magistrate: I do not understand that this is so, but the effect is that the material has not been properly consolidated.

Mr. BESLEY said a statement had been made that care was not taken to keep the different parts of the road distinct, and to keep the gas-pipes separate from the other materials, but in the trench where the big, great care was taken in the matter. With regard to the steam roller question,

it was of immense importance that a roller of this kind should not be allowed to pass over roads where pipes had been put in long before steam rollers were invented, and where drains and sewers were made below, so that the Gas Companies could not get lower than they did; and that an accident such as the one which happened at Brighton should not be of common occurrence in London. It was not the duty of the Vestry to see to anything other than that the road carried the traffic as conveniently as it did before. It was not for them to say where the steam roller should, or where it should not be used; they had to consider what was under the road. The Gas Companies had equal rights with the Vestries. The Legislature had given them a right to lay their pipes for public convenience; and the Vestries had no freehold rights there at all. The demand was that the Vestries should roll their steam rollers wherever they pleased; and now, or later, the Gas Companies could not get lower than they did; and that to show that the steam roller was the actual cause of leakage which had occurred at the joints of the mains. On the map would be seen little marks showing that every joint had had to be looked to, and the Company had all put to an expense altogether of about £2000. In certain parts examined, where the pipes were at a greater depth, there was no leakage at all; but in the Canal Road the Vestry had caused a very large loss of money to the Company by compelling them to do the very work which it was now contended was not properly executed. It would be shown that the proper mode of treating macadamised roads was adopted on this occasion. Not only would the Company's workmen be called, but also gentlemen of position who would not talk such rubbish as that concrete was a natural substance—rubbish of which Mr. Knight ought to be ashamed—because it was perfectly well known that concrete was not a natural result of traffic, but it meant the mixing of gravel in a wet state with some combination of lime and water. Even so, it would be proved that possible resemble flagstones. He would show that this road had been dealt with in the only way in which it could be made to solidify gradually and properly, and if it were to be rolled down the probability was that subsidence would occur in particular parts of the ground, and there would be a great deal of holes in the surface. He would show that the Vestry had wedged to their notion in this matter, they might have done the work themselves in the way they said it ought to be done, and sued the Company for the amount of the expenses. The defendants would have been extremely pleased if this course had been taken, and the Magistrate ruled from making up his mind on the matter entering his verdict.

MR. JUTSUM: So we could if we did the work, and we could come here too.

MR. BESLEY: He should maintain that the summons was either bad by duplicating, because two offences could not be put into one summons, or that the summons was bad by not pretending to prove.

THE MAGISTRATE: What are the two offences?

MR. BESLEY: Said "Not with due diligence causing the surface of the road to be filled in" might be one offence, and "Not with due diligence causing the surface to be put together in a proper and substantial manner" might be another. Whether or not two offences, he maintained that the words "with due diligence" governed the whole matter, and that was the meaning of the words "with due diligence"? The Gas-Works Clauses Act said the Company were to be allowed twelve months. His friend Mr. Jutsum was on the horns of a dilemma, for he said that not making the surface good in a proper and substantial manner was the offence; in which case the other must be a separate offence. If he (Mr. Besley) was right that "due diligence" governed the whole matter, why was the section in the Gas-Works Clauses Act to be repealed, which said the Company were to go on making good any subsidence up to the end of twelve months, and the notice of opening was only dated Sept. 11, 1880? Where was the want of due diligence? If this road was opened in Sept. 1879, and was now, according to their evidence, "a road over which traffic goes," he would not stop to consider the ridiculous point about kicking up the gravel with dancing-shoes. He would show that the proper road had been adopted, and that time was not lost. The Company were willing to meet all their responsibilities, but they were not willing to be vexed with the whims and oddities of the Surveyor of this particular district.

THE MAGISTRATE: No doubt the words "with diligence" do not govern the whole case. **MR. JUTSUM:** said it was all one complaint.

THE MAGISTRATE: And you base your complaint on the 11th section of the Gas-Works Clauses Act?

MR. JUTSUM: said he had never repealed.

THE MAGISTRATE: said he had never repealed.

MR. BESLEY: said he had never repealed. **MR. BESLEY:** said he had been in the service of The Gas-Light and Coke Company as a foreman of main-layers for 14 years. He commenced the work in the Canal Road on the 6th of September, and was on the spot two or three times a day. Messrs. John Aird and Sons were the contractors. Reports were made from day to day of the work done, and there was no delay in carrying it out. There were as many as 18 openings at one time, extending over about 36 yards. The openings were filled in by as far as possible every night, and the public were properly protected by means of lights. He saw Messrs. Aird's people doing the work; they took the macadam out and put it on one side. The kind of soil, which was a rather hard core, was put in another place, and the bottom was back trenched. When the opening was filled in, a pipe was used by which the water was run in to consolidate the bottom, which was then rammed in. Then a second layer was put in and rammed, and finally the macadam was placed on the top. In places where the ground was a little soft, a lot of broken hard stuff was put in by Messrs. Aird and Sons, and it was not till the work was done that mud or slush was used; only water to consolidate the bottom, and it was as good a road as it was possible to make. The work was finished on the 14th of September, and there was no delay in doing it. The traffic had been going on ever since.

MR. BESLEY: You know of your knowledge that the Vestries, in localities where you have been engaged, have constantly required you, under the Act of Parliament, to make good the repairs in three months?

Witness: Yes; and they have wanted a second and third voucher very often.

And also if there should be a subsidence during the succeeding twelve months?—Yes.

Is there any indication whatever in the Canal Road of any defect in the mode in which Messrs. Aird and Sons have done their work?—No. The Cross-examination by Mr. Jutsum, witness said that in his opinion the road was in as good a state now as it was before. He had seen it on the previous day at the position of every hole, and was prepared to swear that it was as level as it was before the work was commenced. He had been on the spot sometimes an hour and sometimes an hour and a half at Beckton to the City, but he had never seen any defect in the work at this particular time. He knew how the holes were opened, and also how they were filled in. His definition of "hard core" was broken rubbish or broken pieces of anything laid into the surface of the macadam and kept together.

MR. JUTSUM: And you consider that it is as good as hard macadam?

Witness: We had macadam on the top of it.

I understand you to say you put that on the top, and filled it in 7—No; we put macadam on the top.

First you put the hard substance, then the soft stuff, then the middle stuff, and then you say you returned the granite?—I said we put in hard core. Really we put in more stuff than we took out.

Is it a usual thing that put in more ground than you take out?—When we fill in with water it is.

You say that a natural soil is not so compressed as a loose soil. You would not call it a natural soil when a pipe has been taken out some time before?—No.

How long do you consider it will take to consolidate it?—I consider it would have taken two or three years if it had not been filled in with water; but we took the precaution to use water so that it should not be so long.

Do you mean to say the ground was not consolidated before you commenced work?—All round the mains it was—round the surface.

What was the stuff at the top composed of?—Macadam.

Where were the clinkers?—About a foot off.

THE MAGISTRATE: Bearing in mind what these holes were, you say they are now filled up?

Witness: Yes.

Am I to understand that the holes are in as good a condition as any part of the road?—I do not say as good as any part of the road, but I say in as good a condition as when we went there. I consider some parts of the road, where we have not been, in as bad a state as any portion of the road.

In consequence of this, has the filled-up portion of the road become as good as the neighbouring part?—You could not expect that in about two months; but I say it is as good now as it was before we started—I mean on the surface.

Is the surface of that part in as good a condition as the other?—It is not so solid, but it is as level as the other.

How is it that it is not so solid?—It has not had time to consolidate in the same way as when the steam roller has been over it.

William Press, examined by Mr. BESLEY, said he had been in the employ of Messrs. Aird and Sons for the last 14 years. He was a foreman of the team, and the team was made for the purpose of examining mains and preventing leakage by resetting the joints. He was on the work every day from four o'clock in the morning sometimes till six or eight o'clock at night. Earth could not be filled in better than by mixing water with it; two or three shovelfuls could then be put in, and then the water was run in. There were only about 6 inches of macadam, and then hard materials—ballast and brickwork—about a foot thick; they were placed by themselves, and the bottom stuff was put on the side of the road. The road now was in a better condition than previously. No material had been taken away; on the contrary, a load or two of ballast had been used. The other portions of the road wanted repairing before they were touched by the contractors.

MR. JUTSUM (in cross-examination): What are your instructions with regard to the filling in of these holes? I suppose you do it as cheaply as you can?

Witness: No; far from that. I was always required to do the work properly.

You say the road is in as good a condition now as it was before?—No; I say it is now in a better condition.

And that your filling up has been a perfect boon?—Yes; in places I say it has been.

Mr. Thomas Charles Hersey, examined by Mr. BESLEY, said he was Chief Inspector of The Gaslight and Coke Company, by whom Messrs. Aird and Sons had been employed for between 30 and 40 years. Payment was made to them for their work according to schedule prices, and no contracts were made, so that there was no motive for scamming the work.

MR. BESLEY: From your knowledge of filling in trenches, can you say whether a better mode could be adopted than that of keeping the material that comes from it apart, and taking the soft material and ramming it down with water?

Witness: No; those are my instructions about it.

Have you seen the road since it was finished?—I have.

Is there any appearance of any fault on the part of the contractors in relation to it?—When I first heard of this summons I went and examined the road.

You object to the steam rollers running over your mains when they are within a certain distance of the surface?—I do, from the number of accidents we have had, caused by leakages from the joints.

Do you get any reports from the men on the road, if the Surveyor would communicate with you, point out where those pipes were?—I certainly should.

In your judgment, would it be proper to use a steam roller on this road, as the Vestry want you to do?—No. If Mr. Knight had asked me, I should have objected to it.

With regard to Mr. Knight's plan of two platforms of concrete in these particular holes, would this improve the general character of the road?—I do not think so; I have never seen it done.

Have you ever heard concrete described as it has been to-day, as road material, and solid when you did not use a steam roller?—No.

Was there any motive for delaying this work?—No. My instructions were to hurry the thing on as quickly as possible, and no expense was to be spared.

THE MAGISTRATE: What would be the process required in order to make it as good as solid when you did not use a steam roller?—No.

Witness: We ram in layers. After our contractors men have put in the layers, we have a surveyor whose special business it is to go over the work.

What does he do?—He takes up some of the material that is put in; and if it is of special business being paving, he puts it in again, and rams it down in layers.

Cross-examined by Mr. JUTSUM: The weight of the rammers, with iron at the end, is from 15 to 20 lbs.

MR. JUTSUM: You say there is no better mode of filling in than the one you have just described?

Witness: I do not say that. I say that ours is the best mode we know of.

That is to say, it is the best way for yourselves?—No; it is the best way for you.

Do you consider a steam roller is better, you would be quite willing to meet us on that?—No; I would not do it.

Do you mean to say a road made up by a steam roller is not preferable to one made of granite ground in gradually?—I should think it is the best way you could do it.

Do you mean to say it is brought into contact with gas-mains, you think it is not better?—No; it is most objectionable—it breaks our mains. I also object to the expense of the concrete.

Do you mean to say a concrete bed would not be an advantage?—I think it would be a disadvantage.

But still if we want a concrete bed we can have it?—If you put a concrete bed over the road from side to side, it would be an advantage.

Supposing we think it better to have a concrete bed without a steam roller, you still would object?—I do not quite follow you.

You understand the requirement. It was asked that we should have a concrete bed with a small lap on each side, and use a steam roller?—In the Mile End Road, but not in the Canal Road?

Yes; in the Canal Road?—I gave way as regards the Mile End Road, because I found the concrete there.

Are you prepared to swear that there was concrete in the Mile End Road before you took it out?—I am prepared to swear I put more concrete in on each side than I found in.

The **MAGISTRATE**: That you would not do in the Canal Road?

Witness: No; there is not any concrete there.

Mr. **JUTSUM**: You are prepared to swear there was concrete in the Mile End Road?

Witness: No; I do not say so. I say there was a hard substance there which I should call concrete; and we put in lime concrete, as we were asked to do.

Then you do not altogether disagree with Mr. Knight, that concrete is not necessarily made up of a particular substance?—I say the only concrete that I have heard of in 20 years experience is concrete made of lime and cement.

And this you say found in the Mile End Road?—No; I say I put it in.

Did you not say you put it in because you found it there?—I cannot say what it was made of.

Did you not say that the ordinary granite and gravel?—I cannot say what the constituents of it were. I gave an extra foot of concrete on each side of the road, whatever it was made of.

You would say it was concrete, and if I could by any means show it was concrete not composed in the way you say, you still admit it was concrete?—I admit that Mr. Knight said it was.

Mr. Knight said so here, and you might have followed the same process in the Canal Road?—I have not heard him say it was concrete in the Canal Road, the same as it was in the Mile End Road.

Re-examined by Mr. **BSLEY**: The substance we found in the Mile End Road was certainly different from what it was in the Canal Road. As a matter of fact, where mains have been laid for 30 or 40 years, they will not stand the steam roller. Where mains have been laid of late years, since the introduction of steam rollers, they have had thicker joints, and in those cases we do not object to the use of these rollers.

Mr. **George Frederick Fry**, examined by Mr. **BSLEY**, said he was Surveyor to the Strand District Board of Works and a Member of the Institution of Civil Engineers and of the Institute of Surveyors, and had had experience in road-making for over 32 years. He had heard the evidence, and the method adopted by Messrs. Aird and Sons was the same as he should have employed. Ramming was the quickest and best way of consolidating a road.

Mr. **BSLEY**: Of course you are aware that the Gas-Works Clauses Act gives a competent power to reinstate the roads in three months, and compels them to repair them, if there is subsidence, within twelve months?

Witness: Yes.

In further examination, witness said that he only knew one case of concrete being put into a macadam road, which was in Regent Street, and there it worked up through the stones, and proved an entire failure. In some statements made by the witnesses he thought that every diligence had been used in filling in the holes and making the road good, and the time occupied was not too long. He had been along the road that morning, and it was a curious circumstance that wherever the road had its true rounding, this was identically the place where the openings had been made; but where the road was faulty, and the crown below the channel, it was where the original road had not been disturbed. Had no openings been made the road would have required repair at the present time.

Mr. **JUTSUM** (in cross-examination): Are you prepared to swear that any portion of the crown of the roadway below the channel?

Witness: I should say level with the channel. It is some inches below what it ought to be. A good road should be well rounded on the top, so as to get the rainfall off as soon as possible.

To sum up your evidence, the condition of the road generally is very bad, but the portion of the reinstated part is very good?—That is not what I said, but I do not object to your view of the matter. I mean to say that where the road has been reinstated, it has been restored to the proper formation, and where it has been worn away the parish have neglected to reinstate it.

In a further examination, witness reiterated his opinion that the portion not touched by the Company wanted repairs, but the portion touched by them had been reinstated to its original formation.

Mr. **JUTSUM**: What do you call the "original formation"?—what the road might have been 20 years ago?

Witness: No. I heard Mr. Knight say that some time ago he repaired the road, and had a steam roller upon it, and no doubt from his knowledge of roads he restored it to its original formation; and now the Gas Company have done the same. Where it is not repaired by the Company it is very much worn by the steam roller, and should be restored to its original condition.

Further cross-examined, witness said there were not many macadamized roads in his district, and he did not think a steam roller was ever used there. He had no hesitation in saying that the restoration of the road in this case was done as fairly and as honestly as possible, so far as he could say.

The **MAGISTRATE**: The new part will frequently be getting out of repair and requiring restoration?

Witness: So far as I represent Vestries I very much prefer holding these gentlemen to the contract of twelve months, and keeping them feeding with materials, so that if any sinkage may occur, to running over a roller with some concrete in the first instance, which would be very deceptive.

The **MAGISTRATE** said that seemed to be the whole case. New work, of course, could not be compared with old work, except by the lapse of time, and it would require time to make it perfect. He did not think he need trouble Mr. Bealey any further, but would hear anything Mr. Jutsum had to say.

Mr. **JUTSUM**: The Road should be brought as near perfection as it could be.

The **MAGISTRATE**: But, after such experience as we have had to-day—especially from gentlemen representing such a large body—how can I gaisay that which they have given in evidence?

Mr. **JUTSUM**: All I can say is, that according to the Act of Parliament the work must be done to the satisfaction of the Vestry, and also of the Surveyor.

The **MAGISTRATE**: Of course it must be reasonable satisfaction; that is what is meant.

Mr. **JUTSUM** submitted there was nothing unreasonable in the present requirement, because the road had been consolidated and bound together

by a steam roller. He did not absolutely require the use of a steam roller, because a very heavy roller drawn by horses would have the same effect.

The **MAGISTRATE**: We have heard from very competent witnesses that there is danger in using these heavy rollers.

Mr. **JUTSUM**: That is the objection, I think.

The **MAGISTRATE**: As regards new roads, you make them as firm as you possibly can, and they cannot be firmer than a steam roller will make them. If you do not use it you must give the road constant attention, and must see that it is made as it should be; therefore, one is an act, as it were, of a day, for by putting on these heavy steam rollers the road is consolidated at once, whereas the filling up of holes and then consolidating them by hand labour and by ramming is a work of time, but it is not attended with any danger.

Mr. **BSLEY** said he proposed to call Mr. Tomkins.

The **MAGISTRATE** said he did not require to go any further into the matter. He thought Mr. Bealey had satisfactorily answered the complaint, which was that the Gas Company had not, with due diligence, caused the surface of the Canal Road to be made good in a proper and substantial manner. By doing what they had done, they had repaired the road to a certain extent, and within the time limited by the Act the portions which had been opened would be as firm as the other part. It could not be expected that the new part would be exactly the same as the old part, but if the Company had reasonably exercised the powers vested in them—and the witnesses had stated that the road was made as good as could reasonably be expected—he thought they had done all that was required. They must make it complete in the end, but they could only do that by constant attention.

Mr. **JUTSUM**: The Act contains the words, "As sound and compact as could reasonably be made."

The **MAGISTRATE**: This, I think, they have done.

Mr. **JUTSUM**: The Act does not say so; they say the work is done well.

The **MAGISTRATE**: The last witness says it is done as well as the circumstances of the case would admit. They cannot consolidate the old material by putting new material in—nor would a steam roller—but in course of time it would become as hard as so much iron.

Mr. **JUTSUM**: If a certain substance were put in at the bottom it might be different.

The **MAGISTRATE** said he had only to decide whether or not the Company were guilty of neglect. It appeared to him that they filled up the holes in the road as well as they could under the circumstances, except that they had not used a steam roller, and he thought they might very well be excused for not using one. They were, however, liable to look after the road up to a certain time; not, he supposed, that the Legislature contemplated that a new thing would consolidate and become as good as an old thing in the same time.

Mr. **JUTSUM** said that might be the view taken by the Gas Company, but it was not the intention of the Metropolis Local Management Act.

The **MAGISTRATE**: With regard to building a wall, or anything of that kind, the work might be made perfect at once; but it could not be so in a case like the present. Unless I am to overrule the evidence, I must dismiss the case. I do not wish to say that to do so is to do justice to the plaintiff, for the evidence spoken according to their view, but a very large quantity of evidence has been given to show that the restorations were made in as complete a manner as the nature of the case would admit of. I should like to have seen the road itself, but I do not suppose that this would have been asserted.

Mr. **BSLEY** said he had a number of other scientific witnesses present, if they had been required. He must ask for reasonable costs, as the parties were both public bodies.

Mr. **JUTSUM** said it was not a case in which any ill feeling had been shown, and it was one which it was requisite should be tried. The **MAGISTRATE** said he should not impose any costs in the way of a fine, or anything of that kind; but would allow 5 guineas.

Miscellaneous News.

THE CORK CONSUMERS GAS COMPANY.

There has just been issued by the Corporation of Cork, a report by their Auditor (Mr. Michael P. Buckley) on the accounts of the Cork Gas Consumers Company for the year ending June 30 last, together with comparative statements for the five years, and working statement for the six months January to June, 1880.

From this it appears that the present outlay of the Company on capital account is £151,493 ss. 8d.; and they have a balance in hand on this account of £39,808 19s. 4d. The total thus shown (£191,302) has been raised by share and loan capital, in the proportion of £135,802 and £15,500 respectively; while the Company have power to raise an additional £14,898 by shares and £19,300 of loans. During the last five years the permanent investment of the Company has increased from £144,039, as it stood at June, 1876, to the figure named above. The net revenue has in like manner increased from £15,632 to £16,830; and the reserve-fund from £4937 to £11,967.

The working statement for the six months to June last gives the coal used as 9515 tons, at an average price of 13s. 11½d. per ton. This consisted of 91·83 per cent. of Newcastle and 8·17 per cent. of Welsh Steam coal, cost £618 18s. 7d., while there was received for residues £4962 8s. 7d.; leaving the net cost of coal as £1201 10s. or 2s. 6½d. per ton, and £8·82d. per 1000 feet of gas sold. Working expenses amounted to £8644 17s. 1d.; or 18s. 2d. per ton of coal carbonized, and 2s. 3½d. per 1000 feet of gas sold. The receipts from private retail and public lighting (£15,042 12s. 7d. and £2020 18s. 3d. respectively) were equal to £1 15s. 8½d. per ton of coal carbonized, and 4s. 6·36d. per 1000 feet of gas sold; leaving as profit on the manufacture £7217 5s. 3d., which represented just over 15s. per ton of coal carbonized, and 1s. 10·7½d. per 1000 feet of gas sold.

Appended to the report is an elaborate comparative statement of the principal items in the Company's accounts for the five years from June, 1876, to June, 1880, some of the figures in which it will be interesting to notice. During this time the capital employed per ton of coal carbonized has increased from £7 1s. to £7 10s. 8½d.; while, on the other hand, the cost per 1000 feet of gas sold has decreased more than 1s. 6d.—viz., from £1 6s. 11½d. to 19s. 11½d. The quantity of coal carbonized, has varied somewhat, though the cost has steadily decreased year by year, as the following figures will show:—

Coal Carbonized.					Gas Made.				
Total.		Per Ton.		Amount.	Total.		Per Ton.		Amount.
June 30, 1876	21,339 tons.	15s. 5½d.	£16,513 4s	7	170,477 cu. cub. ft.	7992 cub. ft.	7992 cub. ft.	8	8321
June 30, 1877	21,821 "	14 8	16,006 13s	8	181,572 "	"	"	"	8354
June 30, 1878	20,066 "	13 6	14,073 17	2	187,115,000 "	"	"	"	8621
June 30, 1879	22,114 "	12 11½	15,248 11	11	193,200 "	"	"	"	8668
June 30, 1880	20,530 "	12 11½	15,311 16	2	187,374,000 "	"	"	"	9127

In like manner the gas sold per ton of coal carbonized has, with one exception, advanced thus in the five years:—0717, 0757, 7365, 7222, 7760 cubic feet.

In connection with the above table, the following, showing the value of the residuals sold and the net cost of coal, will be interesting:—

	Residuals Sold.			Net for Coal.		
	Amount.	Per Ton of Coal.		Amount.		
June 30, 1876.	£10,548 17 10	9s. 10 1/2d.		£3964 6 9	per ton, 3s. 7 1/2d.	
June 30, 1877.	10,146 10 3	9 1/2		3840 13 5 1/2	3 1/2	
June 30, 1878.	9,903 15 3	9 7		4170 1 9	3 1 1/2	
June 30, 1879.	9,528 3 10	9 9		3419 16 1	3 2 1/2	
June 30, 1880.	10,568 12 3	10 3 1/2		2745 3 1 1/2	2 8	

The following are some few of the other particulars given in Mr. Buckley's exhaustive summary:—

	Total Working Expenses and Coal, less Residuals.			Gas Rental.		Profit on Gas.	
	Amount.	Per Ton.	Per 1000 Sold	Amount.		Amount.	
June 30, 1876.	£20,482 8 2	18s. 2 1/2d.	2s. 10 1/2d.	£35,889 8 7		£15,406 8 2	
June 30, 1877.	20,366 19 0	18 8	2 9	35,068 8 2		14,719 9 5	
June 30, 1878.	19,761 11 18	18 1/2	2 9	35,217 1 3		15,456 8 2	
June 30, 1879.	19,154 18 6	18 6 1/2	2 6	33,156 10 7		15,174 1 11	
June 30, 1880.	20,131 3 4	19 7 1/2	2 6 1/2	35,394 8 11		15,823 5 7	

THE PURCHASE OF THE LINCOLN GAS-WORKS BY THE TOWN COUNCIL.

A Special Meeting of the Lincoln Town Council was held on Monday last week—the MAYOR (Mr. B. Cannon) in the chair—the business on the notice paper being “to take into consideration the propriety of promoting, during the ensuing session of Parliament, a Bill to give authority to an agent or agents for the transfer to the Corporation of Lincoln of the Lincoln Gaslight and Coke Company's undertaking; to extend the gas limits; to increase the number of wards of the city of Lincoln; to confer further powers on the Corporation relative to water, markets, and fairs, and other matters of local government; and for other purposes.”

The advertisement of the Bill, and the provisions of it, having been taken as read,

ALDERMAN MALTBY moved a formal resolution sanctioning its promotion. In doing so, he said he thought that as the Council, as a Council, and not as the Urban Sanitary Authority only, would reap considerable benefit from the passing of the Bill, some proportion of the expenses of promoting it ought to be paid out of the corporate funds. He therefore moved that one-half of the costs be paid out of the council fund, and the other moiety out of the general district rate. There was little doubt but that the Bill would be passed without any difficulty, and that it would be a new step which would be wanted, as the money could be paid out of the reserve-fund; but in case more money should be wanted he thought it only fair that the costs should be divided as he suggested.

ALDERMAN HARRISON seconded the motion. The Town Clerk, in reply to a question, said he could scarcely tell yet what it would be the cost of promoting the Bill, it depended so much upon whether it was opposed or not.

The resolution was then carried unanimously, and the Council shortly afterwards adjourned.

THE GAS SUPPLY OF LYTHAM.

LOCAL GOVERNMENT BOARD INQUIRY.

On Tuesday, the 10th inst., Mr. C. N. DALTON, one of the Inspectors of the Local Government Board, called at the Lytham Gasworks, and gave to an application made (1) to enable the Improvement Commissioners to re-borrow the loans raised by them for gas purposes under the Local Improvement Act, 1847; (2) to extend the period within, and to vary the manner in which such loans are to be repaid; (3) to provide that all moneys hereafter re-borrowed for such purposes shall be chargeable upon the gas-works, and the interest due be paid out of the profits; and (4) to provide for the application of all revenue arising from the gas-works. The main object of the application was to separate the gas account from the general district account. Under section 9 of the Lytham Improvement Act, 1847, powers are given to the Commissioners to construct the gas-works, and section 5 of the same Act further empowered them to borrow on mortgage any sums not exceeding in the aggregate £10,000. A Provisional Order was obtained in June, 1874, by which they were authorized to borrow a further sum of £5000, for the purpose of extending the gas-works and mains. The Commissioners, by these powers, incurred an outlay of £9200, but it was now stated that the gas-works were year by year increasing in value, and the profits arising from the consumption of gas were considerable. Up to the present time these profits have been carried (after certain payments have been provided for) to the relief of the general improvement rate. Since 1878, however, the district under the control of the Commissioners has been greatly enlarged, a considerable area of a strictly rural character having been added in pursuance of powers obtained under a Provisional Order granted in April of that year. Within the extended area there are very few consumers of gas, and the Commissioners consider that it is unfair that the gas-works should derive, at the expense of the consumers, any relief of the rates by reason of the profits of the gas-works being applied to general improvements. What they desire is, therefore, that a separate and distinct depreciation and sinking fund be formed from the gas revenue, for the purpose of keeping the works in proper order, so that the general improvement rate of the town shall not in future be mortgaged for this purpose. The gas-works would, of course, have to bear the whole of the burden—principal as well as interest—of the £9200 already borrowed and expended upon them, and any further sum that might be borrowed hereafter. The general improvement rate would then be relieved of this incumbrance, and the Commissioners are of opinion that in a very short time they would be in a position to make a very palpable reduction in the price of gas, which has hitherto stood at 5s. 6d. per 1000 feet, less 5d. discount. They desired, also, that the time for the repayment of the loans obtained on account of the gas-works should be extended for 60 years, and that the £9200 with interest be repayable by annual instalments of, say, 1-60th part. The main object of this proposal is that by diminishing the annual instalments a large sum of money might be yearly laid by to form the sinking-fund, and to meet any further extraordinary expenditure, which would otherwise have to be paid by borrowing more money. The gas-works were stated to be now entirely maintained out of the revenue, and there is a sum of £760 15s. 2d. standing to the credit of the sinking-fund in respect of the ordinary provision, and £300 in respect of the special provision required by Article 8 of the Provisional Order of April 4, 1878; in addition

to which it is expected that £450 will be placed towards paying off the existing gas debt of £9200 at the expiration of the current financial year.

The Commissioners in attendance were Mr. Wilding (Chairman), Major Cunliffe, Mr. Pearson and Mr. Waring, and they were accompanied by the Local Clerk (Mr. Dixon) and the Surveyor and Gas-Works Manager (Mr. T. Bower).

In reply to the Inspector, Mr. BOWER said during the last two years the gas-works had in a great measure been rebuilt, the cost being defrayed partly out of the revenue and partly out of the loan of £5000. He estimated the present value of the works at £12,000. His general basis of valuing the works was at the rate of £10 for every 100,000 feet of gas made, and the make at the present time was 12 million feet. The quality of the gas, he added, was considerably higher than in many districts, 60 per cent. of canal being used, and the average illuminating power was about 22 sperms candles.

The Inspector asked what was the proportion of the amount spent in partly reconstructing the gas-works out of the revenue account and the general account.

Mr. DIXON said it was impossible to obtain any reliable information on this point, as both accounts had gone together. At the close of the inquiry the Inspector promised to lay his report before the Local Government Board as early as possible, so that the proposed arrangement might, if possible, come into operation at the commencement of the next financial year.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

The Ordinary Half-Yearly General Meeting of this Company was held at the Local Offices, No. 30, Gracechurch Street, E.C., on Tuesday last—Mr. H. P. STEPHENSON in the chair.

The SECRETARY (Mr. Alfred Lass) read the notice convening the meeting, and the following report of the Directors was taken as read:—

The Directors have much pleasure in submitting to the Shareholders the accounts of the Company for the half year ending on June 30, 1880. These, with the annexed report of the Engineer, show the progress of the Company.

The Directors have to state that the profit for the half year has amounted to £121 5s. 2 1/2d., which, added to the balance brought from the last account, makes £294 6s. 6 1/2d., and that after paying the dividends to Dec. 31, 1879, the interest on debentures to June 30, 1880, and transferring a further sum of £100 to the reserve-fund, there remains an available balance of £147 8s. 3 1/2d., out of which the Directors recommend the declaration of a dividend for the half year ending the 30th of June last, on the preference share capital at the rate of 8 per cent. per annum, and on the ordinary share capital at the rate of 7 per cent. per annum, both less income-tax (except upon £207 16s. 3 1/2d. to be carried forward to the next half year's account).

The dividend, if sanctioned, will be payable on the 1st of December next.

Engineer's Report.

Gas-Works, Georgetown, Sept. 2, 1880.
To Thomas Hughes, Esq., Q.C., Chairman, and the Directors of the Georgetown (British Guiana) Gas Company, Limited.

Gentlemen,—I have much pleasure in submitting to you the usual half-yearly report, to the 30th of June last, upon the returns which have been forwarded to you. I will be satisfactory. The extension of the retelling has been completed, which has enabled several coal ships to discharge their cargoes without lighterage. The gas holders and in good working order, and the retort-house, purifier-house, governor, and all the buildings and machinery, are in an efficient state of repair. During the past half year the rental shows an increase of 421-92 dollars, over the previous half. The working expenses have been kept as low as possible, consistent with efficiency of working. During the past half year 12 houses have been fitted with 148 lights, and 122 added to old consumers, making a total of 370 new lights.

In conclusion, I have to thank the Board for their consideration, and hope they will consider the results of the past half year's working satisfactory.

(Signed) THOS. B. YOUNG, Engineer and Manager.

Dr.		Balance-Sheet, June 30, 1880.		Cr.	
Share capital—	£200 paid up	£51,000 0 0			
412 5s preference shares,	fully paid	2,000 0 0			
Debenture bonds	£5,500	5,500 0 0			
Retort renewal-fund account	13 11	5 11			
Debt debt fund	225 15	0 0			
Bills payable	750 0	0 0			
Reserve-fund account	22 10	0 0			
Amounts owing to sundry parties	499 9 7	0 0			
Profit and loss account, net revenue	1,473 4 3 1/2	0 0			
		£44,037 14 9 1/2			£44,037 14 9 1/2

Revenue Account.		Cr.	
Gas and rental of meters	£3,622 2 7 1/2		
Residual products and fittings, &c.	896 19 5 1/2		

Costs	£876 12 7 1/2		
Purifying account	70 5 6		
Wages account	325 2 3		
Repair and maintenance of works and plant, &c.	202 1 2		
Salaries	629 9 4		
Rent, rates, and taxes	2 0 1		
Directors and Auditors fees	138 0 8		
Trade and general charges	171 10		
Loss on debts and allowances	48 6 8		
Law charges	33 12 6		

Balance carried to profit and loss, net revenue	£2,777 16 10 1/2		
	1,541 5 2 1/2		
	£4,319 2 1		£4,319 2 1

Profit and Loss (Net Revenue) Account.		Cr.	
Dividend, &c., paid to Shareholders to Dec. 31, 1879	£1,167 8 0		
Interest on loans, &c., to June 30, 1880	244 13 4		
Reserve-fund account	100 0 0		
Balance carried forward to the next half year's account	1,473 4 3 1/2		
	£2,984 6 6 1/2		£2,984 6 6 1/2

The CHAIRMAN, in moving—“That the report and accounts for the half year be received and adopted,” observed that the only figures he would call special attention to were those which showed that the Company's profit in the past six months had been £1514, as against £1361 in the corresponding period last year. The other figures were pretty nearly the same as last year. As the Shareholders saw by the report, the Directors had placed another £100 to the reserve-fund, and the Company seemed to be going on slowly and carefully, and improving gradually. Since the close of last half year they had had a small fire, through the spontaneous combustion of some coal. The other figures were pretty nearly the same as last year. As the Shareholders saw by the report, the Directors had placed another £100 to the reserve-fund, and the Company seemed to be going on slowly and carefully, and improving gradually. 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The ENGINEERS (Mr. Alfred Williams) seconded the motion.

The CHAIRMAN, in reply to Mr. Stokes, said the insurance-fund was a marine one. The Directors paid to the fund the premiums they would pay to the underwriters on a great number of their north shipments, and it was gradually but very slowly increasing. The Company had no insurance-fund for fire.

Mr. STOKES inquired what was thought to be the amount of the damage done by the firing of the coal.

The CHAIRMAN replied that it had not been estimated, and it would be very difficult indeed to do so, because some of the coal had been "sweated"—some of the gas had been driven out, but the Directors could not say how much, and would only find out when the coal came to be carbonized. From all accounts, however, the damage done by the fire was not great.

The motion was then put, and carried unanimously; and the payment of the dividends mentioned in the report was also agreed to.

On the motion of Mr. E. K. BLYTH, seconded by Mr. R. KING, a vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, in reply, expressed the thanks of his colleagues and himself. He said that Mr. Hughes, their Chairman, was away founding a colony, and he trusted that his efforts would prove successful.

A vote of thanks was afterwards passed to the Officers in this country and abroad, and

The ENGINEERS having acknowledged the compliment, the proceedings closed.

CURRENT SALES OF GAS PRODUCTS.

(FROM A MANCHESTER CORRESPONDENT.)

The prices of all manufactured gas products appear firm. The demand for tar and ammoniacal liquor keeps well up with the supply.

The fair demand, at prices last quoted, has been maintained. Ammoniacal liquor, bought and inquired after at about same quotations as last (sp. gr. 1.35, 24s. per ton).

Ammonia sulphate, white, sales at £19 5s. to £19 10s.; grey, sales at £18 12s. 6d. to £18 15s. per ton.

Ammonia muriate, best white, £45 to £44; white, £40 to £44; grey, £35 to £40 per ton.

Brown vitriol, tendency to firmness, £2 18s. 6d. to £2 19s. per ton.

Muriatic acid, no change.

Sulphur oxide; no special sales to record, though there have been transactions by exchange for spent oxide.

AMERICAN GASLIGHT ASSOCIATION.

(From the "Official Report" in the *American Gaslight Journal*.)

(Continued from p. 777.)

The first paper read was one by Mr. T. FORSTALL, of New Orleans, on

STOPPAGES IN ASCENSION-PIPES.

The author said that so much had been written on this subject that it might seem exhausted; but having been called upon for a paper, there did not seem to him to be anything more interesting for discussion than the cause and prevention of an evil from which in New Orleans they had suffered so much, and which the remedies most effectual for cure had failed. He would, therefore, first review the various opinions which had been offered as to the cause and prevention of stoppages in ascension-pipes; secondly, describe the New Orleans experiences; and, thirdly, submit, for discussion, a theory of stoppages, suggested by that experience, in opposition to the one generally entertained.

Mr. Forstall then reviewed what has been published about stoppages, commencing with Mr. J. Somerville's paper read before the British Association of Gas Managers in 1871; and in succession noticing the papers contributed to the Association by Messrs. Green and Parby in 1873, and Mr. Hodges in 1874; Mr. Malan's paper read before the North British Association of Gas Managers in 1874; Mr. Martin's paper read before the West of Scotland Gas Managers Association in 1876—all of which were at the time published in our pages. He then referred to papers by Mons. Rouget, of Brest, read before the Société Technique de l'Industrie des Gaz in 1876 and 1878; and to the paper by Mons. L. Brismond, read before the same Association in 1877. (See Translation in JOURNAL, Vol. XXX., p. 491.) As to the opinions of American Engineers, he mentioned a letter from Mr. Egner, of Norfolk, Va., to the *American Gaslight Journal*; and a paper read by Mr. W. A. Wood before the Central New York Gas Engineers Association, in February this year. (See JOURNAL, Vol. XXX., p. 491.) Mr. Egner attributed a great deal of stoppage in the stand-pipe; while as to Mr. Wood's paper, Mr. Forstall says: "This is, doubtless, familiar to all of us, and you will remember how graphically he describes the conversion of his retort-house from a pandemonium into a quaker meeting-house, by the saving grace of water immersion—I should say injections in his ascension-pipes. Alas! We in New Orleans added prayer to the water, but conversion did not follow."

As to the second part of his paper—Stoppages in the New Orleans Gas-Works—Mr. Forstall speaks as follows:—

The evil made its appearance in our works in 1871, with the use of high heats and large yield. Our retorts were small D's, 12 in. by 30 in., in benches of five, carbonizing 1100 and 1150 lbs. of Pittsburgh coal in four hours, and fitted with 4-inch stand, bridge, and dip pipes. The hydraulic main was circular and small, only 16 inches in diameter. During the four years that we continued to run these settings, stoppages were occasional only, mostly in the stand-pipes, rarely in the bridge, and not a single case recorded in the dip-pipe. The last of the hydraulic main remained fluid, and flowed off easily. In 1875 the works were remodelled. Large retorts, 14 in. by 25 in., in benches of six, were erected. The four-hour charge was increased to 1600 and 1650 lbs. (266 and 275 lbs. per retort); the stand and bridge pipes were enlarged to 6 inches, but the dip-pipes inside the hydraulic main were contracted to 4 inches. This contraction of the dip-pipe, in the light of subsequent stoppages there, was possibly a mistake. Its object was to avoid unduly increasing the weight and dimensions of the hydraulic main.

The retort-house is 345 feet long, with a clear width of 82 feet. To secure free ventilation during our tropical summers, the long side of the building are not enclosed by walls, the roof being borne upon two lines of iron columns 26 feet in height. Forty-eight benches extend in line, 24 on each side, back to back, and fronting north and south respectively. The south benches are protected from driving storms and cold winds by rolling shutters, and the columns of the building are protected from the wind by the coal shed, the roof of which is supported by the retort-house columns on that side. The bench settings are all alike, and the manipulation is the same on both sides of the house.

From the beginning the stoppages were more frequent on the new than on the old, and they have been since the commencement from winter to winter, until we were compelled last season to set two men day and night to the special work of clearing out the worst pipes. During a period of 50 days, from December to March, there were 1605 separate, distinct, and complete stoppages in the stand, bridge, and dip pipes of 12 retorts. In spite of every remedy, this state of things continued until May, when the

stoppages, as usual, gradually ceased for the summer, to return when cold weather set in.

A daily record of every stoppage has been kept for more than two years, and many careful thermometer observations of the temperature in the pipes have been made from time to time by Mr. Carroll, the Manager of the works. These records show that the stoppages occur almost exclusively in the pipes of the two upper retorts, and are many times more frequent on the north than on the south side benches; but while this latter condition was constant with regard to the aggregate number of benches under fire, it was found that certain pipes on the south side would be stopped as frequently as the worst on the north side; while, on the other hand, certain north side pipes remained as clear as the freest on the south side. The stoppages extend even into the hydraulic main, which is solid and free from dirt, semi-solid pieces.

The following table shows the stoppages on 20 benches during December and January last. The odd numbers are north, and the even numbers south side benches. No. 25 backs No. 26, No. 27 backs No. 28, and so on to the end of the range:—

TABLE A.

North Side Benches.	1879-80. Dec. and Jan. Days in Action.	Number of Stopped Pipes.			
		Stand.	Bridge.	Dips.	Total.
25	62	5	14	2	21
27	62	0	0	0	0
29	62	0	0	0	0
31	61	0	0	0	0
33	61	72	88	42	202
35	61	82	94	47	223
37	60	96	99	47	242
39	60	43	47	16	106
41	62	75	90	36	201
43	60	29	41	16	86
—	—	402	475	211	1088

South Side Benches.					
		Stand.	Bridge.	Dips.	Total.
26	61	4	12	3	19
28	61	0	0	0	0
30	61	0	0	0	0
32	61	0	0	0	0
34	60	5	7	3	15
36	60	4	0	0	4
38	59	1	3	1	5
40	58	11	13	0	24
42	58	30	34	10	74
44	61	39	45	18	102
—	—	94	121	38	253

It will be here seen that 1088 stoppages occurred in 62 days on the ten north side benches. Of these 402 were in the stand, 475 in the bridge, and 211 in the dip-pipes. The ten adjoining south benches scored but 253 stoppages in the same time, less than one-fourth the number. The exceptional benches are Nos. 40, 42, and 44, with 24, 74, and 102 stoppages respectively, on the favoured side; while Nos. 27, 29, and 31 on the north side were as free as any of the south side benches. Thus, alongside of the general fact pointing to the influence of atmospheric changes from prevailing winds, arose perplexing, anomalous exceptions which, complicate the problem. Again, periodical changes occur of weeks or months. Benches free from stoppages will suddenly fall into line with high scores for several weeks, and then as suddenly drop out again. Thus, benches Nos. 27 and 29 were free throughout December, January, and February, but scored 69 and 59 stoppages respectively during March and April. On May 12, 1879, when every bench had been free for weeks, all the bridge and dip pipes of the upper retorts were stopped on the north side of the house, and on the next day all the corresponding pipes on the south side were similarly stopped. There were no stoppages for weeks afterwards. During all this time covered by these records, the coal used has been from the same mines, the heats have been fairly uniform, and the firing and charging done by the same men.

The next table exhibits the comparative number of stoppages in each of twelve benches during the time when they were actually under fire in the seasons of 1878, 1879, and 1880. The north and south adjacent benches are paired to make plainer the difference between them. The general rule of south side exemption is here shown to be constant, as well as the fact that the south is not quite solid, as bench No. 44 scores 96 stoppages in 82 days.

TABLE B.—Stoppages in Twelve Benches, 1878 to 1880.

Benches.	1878.		1879.		1880.		Totals.
	No. of Days in Action.	No. of Stop-pages.	No. of Days in Action.	No. of Stop-pages.	No. of Days in Action.	No. of Stop-pages.	
No. 27, north	145	47	243	49	177	110	197
No. 28, south	148	4	234	5	190	2	11
No. 29, north	145	45	218	50	135	140	225
No. 30, south	144	9	220	23	196	48	79
No. 31, north	144	56	197	49	202	131	236
No. 32, south	143	13	187	3	203	8	24
No. 33, north	98	66	138	135	209	273	479
No. 34, south	130	0	114	5	236	42	47
No. 35, north	76	30	112	140	160	336	556
No. 36, south	76	0	103	12	165	8	20
No. 43, north	..	..	44	56	37	49	105
No. 44, south	..	..	44	27	38	69	96

The observations taken of the temperature in the ascension-pipes during progressive phases of the distillation furnished no clue to the cause of the immunity enjoyed by the lower retorts of every bench, and by all the retorts of some benches, while in their immediate neighbours the habit of stopping was most strongly developed. With equal charges and heats the temperature in all the ascension-pipes of a given bench varies but slightly at the same distance from the furnace, and at the same period of distillation. From a great number of tests, between which a remarkable conformity exists, the mean temperatures are here given. In the tables, No. 1 is always the lower, No. 2 the middle, and Nos. 3 and 4 the upper retorts. In all the observations the bulb of the thermometer was exposed in the centre of the pipe, and the tube carefully insulated from the metal.

TABLE C.—Mean Temperature in Ascension-Pipes during Distillation.

Charge, 266 lbs.; 4 Hours. Bench No. 37.	Time of Observation after Charging.										Mean of 3 1/2 H.
	5 M.	30 M.	1 H.	1 1/2 H.	2 H.	2 1/2 H.	3 H.	3 1/2 H.	4 H.	4 1/2 H.	
At 7 ft. 9 in. above mouthpiece—	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.
Retort No. 3	455	446	406	365	303	257	198	180	326	2	
Retort No. 2	409	409	428	388	327	286	253	194	318	2	
Retort No. 1	451	437	412	371	322	280	216	180	333	6	
At 12 ft. 10 in. above mouthpiece—											Mean of 3 1/2 H.
Retort No. 3	325	318	286	257	216	199	167		256	8	
Retort No. 2	318	312	284	266	228	196	167		251	2	
Retort No. 1	300	289	273	257	237	210	198		252	8	
At bridge-pipes—											Mean of 3 1/2 H.
12 ft. 10 in. from mouthpiece of No. 3	320	306	291	268	232	198	156	127	237	5	
14 ft. 10 in. from do. of No. 2	320	293	261	218	163	140	142	129	210	7	
16 ft. 10 in. from do. of No. 1	295	292	219	190	163	145	133	122	186	7	
17 ft. 10 in. from do. of No. 4	252	228	210	187	167	145	131	118	179	7	
At 7 ft. 9 in. above mouthpiece—											Mean of 3 1/2 H.
Retort No. 3, 331 lbs. coal	414	392	374	320	216	309	275	239	330	0	
Retort No. 2, 234 lbs. coal	406	385	379	338	309	275	221	181	312	0	
Retort No. 1, 231 lbs. coal	430	383	383	334	275	243	198	165	206	6	
Retort No. 3, 201 lbs. coal	433	421	317	284	261	221	185	154	288	3	
Retort No. 2, 279 lbs. coal	458	448	408	381	378	325	277	261	379	6	
Retort No. 1, 379 lbs. coal	459	432	402	363	319	262	222	228	350	6	

Four facts may be noted in connection with these figures—first, that the temperature is at the maximum just after the retort has been charged, and then constantly falls to the end of the distillation, reversing the conditions which exist in the retort itself; second, that from the moment the gas enters the ascension-pipe, the loss of heat is very rapid along its whole length; third, that towards the end of the distillation the temperature in the bridge-pipes is lower than that of the mixed gas in the hydraulic main; fourth, that an increase in the weight of the charge raises the mean temperature of the ascension-pipes during the whole period of distillation.

The mean temperatures in the bridge-pipes of four adjacent benches, of which two were north and two south, with normal charges, are given in the next table. Of these benches all but No. 36 were persistently obstructed, yet the temperature in No. 3 ascension-pipe of that bench is higher than in the corresponding pipes of benches Nos. 43 and 44, and the initial temperature at the bridge only 12° lower than in the same pipe of No. 85.

TABLE D.—Temperature in Ascension-Pipes during Distillation.

Charge, 266 lbs.; 4 Hours. At Bridge-Pipes.	Time of Observation after Charging.										Mean of 3 1/2 H.
	5 M.	30 M.	1 H.	1 1/2 H.	2 H.	2 1/2 H.	3 H.	3 1/2 H.	4 H.	4 1/2 H.	
Bench No. 45—	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.
Retort No. 3	338	328	313	283	268	236	206	185	277	2	
Retort No. 2	293	273	259	234	207	181	157	144	224	3	
Retort No. 1	267	244	229	206	181	160	146	135	200	0	
Bench No. 36—											
Retort No. 3	336	325	298	272	241	204	170	151	250	0	
Retort No. 2	317	298	278	254	230	199	171	149	236	7	
Retort No. 1	289	264	248	220	208	185	157	138	214	0	
Bench No. 43—											
Retort No. 3	325	309	285	258	229	207	181	151	243	0	
Retort No. 2	316	300	279	252	223	197	171	146	239	7	
Retort No. 1	294	271	250	227	203	172	149	137	212	7	
Bench No. 44—											
Retort No. 3	319	291	261	231	212	192	165	138	211	6	
Retort No. 2	345	324	310	281	249	215	180	146	255	2	
Retort No. 1	309	286	267	241	211	181	160	137	224	6	

To complete these observations by data from other sources, I copy from the *London Journal of Gas Lighting*, of June 4, 1878, one of a series of three tests published by Mr. T. A. Collinge, Gas Analyst to the Corporation of Rochdale.

Temperature in Ascension-Pipes, Rochdale Gas-Works.

Charge, 280 lbs. in 6 Hours. Wigan Arley Coal.	Time of Observation after Charging.					
	5 M.	1 H.	2 H.	3 H.	4 H.	5 H.
	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.
At 3 ft. above mouthpiece	320	440	640	640	380	380
At middle of pipe	210	360	578	580	220	196
At top of pipe	160	190	200	190	120	115

From the same *JOURNAL*, May 23, 1873, the following observations, by Mr. Charles Hunt, of Birmingham, are taken:—

Temperature in Ascension-Pipes, Birmingham Gas-Works.

Charge, 255 lbs.; 6 Hours.	Time of Observation after Charging.					
	5 M.	30 M.	1 H.	1 1/2 H.	2 H.	2 1/2 H.
	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.
At 3 ft. above mouthpiece	248	260	270	274	280	280
At top of pipe	154	168	164	150	140	135

Finally, I must add the following series, determined from curves of temperature accompanying M. Rouget's last paper before referred to. I have selected the hottest retort:—

Temperature in Ascension-Pipes, Brest Gas-Works.

Charge 4 Hours. Weight not given.	Time of Observation after Charging.					
	5 M.	30 M.	1 H.	1 1/2 H.	2 H.	3 H.
	Deg.	Deg.	Deg.	Deg.	Deg.	Deg.
6 in. above mouthpiece	460	509	512	509	473	392
4 ft. 6 in. above mouthpiece	212	221	190	180	169	140

These temperatures are all lower at equal distances from the mouthpiece than those found in our works, and they also differ in this, that the maximum is not reached until one or two hours after charging. Lower retort heats will account for these discrepancies in the English results;

and the free distilling qualities of the Pittsburgh coals, compared with the more refractory French coals, will explain them in the Brest series.

Summing up now the facts of our New Orleans experience we find:—

1. Constant freedom from stoppages in the pipes of four retorts out of six under every bench under similar conditions of heat, charges, and temperature in all the pipes.
2. Complete immunity of every retort in certain benches on both sides of the range, while the upper retorts of neighbouring benches are frequently stopped.
3. Comparative freedom from stoppages of south side benches.
4. Great frequency of stoppages in winter and cessation in summer.
5. The remedies which we have tried exhaust, I think, the whole stock of specifics proposed to cure the evil, except Mr. Malam's elaborate arrangement. The list is a long one:—
 1. The catch shield or diaphragm in the mouthpiece.
 2. External application of water in jets to the surface of the ascension-pipes as patented by Mr. Shiras, of Sharon, Pa.
 3. Water jackets through which a constant flow is maintained.
 4. Steam-jets, large and small, constant and intermittent, above, below, and at mid-height of stand-pipes.
 5. Internal water jets, as practised by Mr. Wood, until the cooling effect cracked several mouthpieces, and the water lay on the mouthpiece floor.
 6. Extra weights of coal in retorts. This was effective only by lowering the heat and greatly reducing the yield of gas.
 7. Lengthening the ascension-pipe 5 feet. This brought down the temperature in the bridge-pipe to 252° at the beginning of the charge, but a stoppage in the bridge-pipe immediately followed the charge.
 8. A thin wrought-iron stand-pipe was tried; but on the fourth day it became so completely choked that it could not be cleaned, and it was taken down.

None of these remedies afforded desirable relief although carefully patiently, and perseveringly applied.

The third division of the paper—dealing with what the author considers the true cause of the stoppages—was as follows:—

Before discussing the conflicting theories of the genesis of stoppages, we must distinguish between them. The hydrations which obstruct the pipes vary greatly in their physical properties under different circumstances and in different parts of the same pipe. They may be divided into three categories:—1. Hard, stratified, graphite-like material, adhering closely to the whole interior surface of the stand-pipe proper. This accumulates gradually until it reaches the highest point above the retort, and is removed regularly between the charges, as forms the most difficult obstruction to remove. 2. Thick, pasty, tough pitch, which balls together under the tools, and drops out in large lumps. This is the most frequent obstruction in our works, and is formed equally in stand, bridge, and dip pipes, and even in the hydraulic main. 3. Dry soot or granular lamp black. The stoppages from this material are rare, and rapidly become fatal. They occur a short time after the retorts are charged, and may extend as far as the dip-pipe. They are very easily removed. Sometimes all three of these characteristic products are found in the same pipe; but, generally, the nature of the stoppage is determined by the predominance of one or the other of them.

It is agreed on all hands that stoppages of any kind occur only when the retorts are highly heated; the first cause, therefore, is in the retort efficiency, and only with the secondary causes must we deal. We can also dismiss from further consideration the dry obstructions of soot, as this substance, when once produced in the retort, is not amenable to change, and must be dropped somewhere in the pipes, unless we trap it in the mouthpiece, on screens and gratings.

The first and second class of stoppages, to which alone preventive treatment outside of the retorts can be applied, may be discussed together. The opinion generally held, as expressed in the papers reviewed, is that they are produced in consequence of the excessive heat in the ascension-pipes, by distillation into pitch of the condensed tar which flows down their surface until successive layers close the pipes. There are two theories of the source of the heat by which this distilling process is performed. Messrs. Malam and Rouget, of Brest, are of opinion that it is in the metal pipe itself, while M. Rouget asserts that the heat which cooks the tar is that of the ascending stream of gas and vapours. The distinction is important, for the temperature of the pipes does not rise to the high degree reached by the current inside of them, except possibly just the mouthpiece. At the height of 5 feet above the mouthpiece, we found the difference, at progressive periods of the charge, to be as follows:—

Time after Charging, 5 M.	30 M.	1 H.	1 1/2 H.	2 H.	2 1/2 H.	3 H.	3 1/2 H.	4 H.
Temp. of pipe . . . 176°	225°	241°	234°	241°	180°	163°	158°	153°
Do. inside of pipe 460°	450°	428°	388°	327°	286°	235°	194°	—

From this it appears that the ascension-pipe gradually becomes heated by the ascending products of distillation from the retorts, reaching its maximum temperature an hour after charging, then steadily grows cooler to the end of the charge.

If the production of stoppages be due to excessive heat in the ascension-pipes, the source of heat must, therefore, be the up-rushing vapours themselves. This theory then, if true, would explain the fact, as we have seen, for stratified stoppages only, of the first class, occurring in the stand-pipe proper, where the heat might be sufficient to distil such material. And if such be the only cause, then would all stoppages be of that character and limited extent. Every ascension-pipe under approximately equal conditions would possess the same tendency to stoppage, for the distillation of pitch from tar on the surface of the pipe would be a mere question of time in any bench with tolerable heats. But we are told that in Paris, when the heat was confined in the mouthpieces and ascension-pipes as far as the hydraulic main, no stoppages took place in them, but that pitch which was in the main. In New Orleans, as I have said, we have very few stoppages in summer, when the pipes are hottest, and in winter they are much less frequent on the south side benches; while there is perfect immunity in the four ascension-pipes of every bench that is most exposed to the radiation from the brickwork, and the internal temperature of which is as high as that of the two which become stopped.

From these considerations I am tempted to believe that the reverse of this theory is true; that, instead of excessive heat, it is the comparative coldness of the ascension-pipes which determines the formation of these obstructions in them. It appears to me probable that, under certain conditions of retort heat, and of the nature of the gas and vapours, a pitch is produced in the early stages of the distillation which solidify upon contact with the relatively cool surface of the ascension-pipes; and, further, that in order to effectually prevent stoppages from this cause, these vapours must be completely intercepted in the mouthpiece itself. This can be effected by cooling the mouthpiece to the point at which it will determine the condensation within it, in a liquid form, of all vapours which solidify on their passage to the hydraulic main; but, at the same time, leaving the ascension-pipes to retain their normal heat, so as to allow the greater portion of the tar vapours to pass over to the hydraulic

main. Perforated diaphragms or gratings in the mouthpieces would assist in this condensing process, as well as entrap the soot deposit.

I present this theory with diffidence, as it has occurred to me only since I have grouped together the materials of this paper, and I have as yet had no opportunity to put it to the test of actual practice; but I think the Paris results with hot ascension-pipes conclusive against the opposite doctrine, while taken in connection with the failure of cooling ascension-pipes in our works, they go very far towards confirming the view just advanced. On this assumption it would follow that the partial relief afforded by such remedies as vessels of water, wire screens, &c., is not complete; because, although right in principle, they but imperfectly fulfil the end of condensing the obstruction-producing vapours, while the great benefits which in many cases have followed the cooling treatment applied to the ascension-pipes, have been the consequence of a simultaneous and independent cooling of the mouthpiece itself sufficient to accomplish the result.

In our own case the various cooling appliances to the ascension-pipes produced rather an aggravation of the stoppages; but their influence did not reach down to the mouthpiece, except when internal water jets were used, and in that instance the cooling effect upon the mouthpiece was confined to its floor, upon which the water dropped directly from the stand-pipe. If any member of the Association has a knowledge of any facts which will tend either to confirm this view, or to explain away the apparent contradiction involved in the theory herein controverted, I shall be glad that I have brought up the subject.

[An interesting discussion followed the reading of this paper, an abstract of which we shall probably publish next week.]

SOME NOTES FROM AMERICA.

(FROM OUR OWN CORRESPONDENT.)

The display of gas apparatus, especially of stoves, at the American Institute Annual Fair being held in New York City, is in many respects in advance of that of any previous year. The usual display of patent gas-burners, governors, and carbureters, is found; but it is not necessary to enter into a description of these, as most of them are devoid of novelty. The Goodwin Gas Stove and Meter Company make a very complete display. Commencing with a small boiling stove of 7 inches diameter, there are all sizes of cookers up to the "hotel range." This Company manufacture the "sundial" stoves, and their completeness excites the admiration of lady visitors at the fair. In the space allotted to this Company, in addition to the cooking stoves, water heaters and parlour heaters are to be found; the former of two descriptions—one a small upright, the other a horizontal range, the latter of two descriptions, a hot-water circulation; the other a portable copper boiler, with a gas burner in the bottom. The parlour heaters burn pure gas, the front of the stove being open and fitted with a corrugated copper reflector. The appearance of this stove is very pleasant. The heater formerly made was twisted, and the flange around the burner. The new model of the Company would not be complete without an allusion to their flat-iron heaters, which burn gas and air, the flame striking directly upon the iron.

The Retort Gas Stove Company also have quite a full display of their wares. The burner used in the stoves of this Company is different from that used in any other stoves. The chief feature of it is that the mixture of gas and air is burned in a solid flame instead of a series of jets, the gas effectively preventing the flame from "firing back." Again, the arrangement of the ovens in the cookers differs from their neighbours, in that the burners are placed in the bottom of the oven, and the products of combustion pass through and around the oven, while in the sundial and the "economy" to be noticed further on—the burners are below the oven, the products of combustion passing between the non-conducting lining of the exterior and the shell of the oven. The Retort Company also have on exhibition samples of parlour heaters, cylindrical and rectangular in shape, fitted with corrugated copper reflectors, and burning pure gas.

The "economy" stoves are exhibited by the American Gas Company. As they have but recently commenced to manufacture these stoves, they have not a complete line to display, but the burners with which they are fitted excite much admiration. The arrangement for heating the oven and roaster here used differs from that of the "sundial." In both, the one gas and air mixture is burned in a solid flame instead of a series of jets, the other by radiation; but in the former the mixture of gas and air is used, while the latter burns pure gas. As to the respective merits of the two: On the one hand, it is known that a gas and air flame radiates less heat than a pure gas one, and as a possible offset against this is the chance for the deposition of carbon, and consequent loss of heat of the good stove, it is not altogether unjust to iron heads to the latter. The American Meter Company are also in the field with several patterns of heating stoves. The "economy," a cylindrical stove fitted with the patent burner from which it takes its name; the open heater, with corrugated copper reflector using pure gas; the "sunbeam," a large stove 42 inches high, open in front with reflector and "economy" burners, also a couple of jets from which pure gas is burned, thus illuminating the reflector; and a cylindrical stove 36 inches high, and 10 inches in diameter, open like the previous one, and with similar burners.

The stoves exhibited by these Companies are daily increasing in favour. Those companies which have pushed this branch of their business, and have endeavoured to introduce the stoves to their customers, have met with a good deal of success. In many of the large cities—Cincinnati, for instance—stores have been opened for the sale of gas stoves.

The new departure for this country of constructing heating stoves to burn pure gas, instead of the mixture of gas and air, is a good thing, and cannot be disputed that they are very pleasing to the eye, and when lighted will arrest the attention of the passer-by, while the closed ones, burning gas and air, remain unnoticed. This recommendation would be of little worth if they were not as economical as their companions of less size, and if they did not possess the little detail of a good design for mixing air with the gas before ignition should make the gas more efficient for heating a room. No one can dispute the supremacy of a burner on the Bunsen principle for cooking purposes, where cold metal surfaces are placed on the flame, such as saucepans, kettles, &c.; but when the gas is used only for heating a room, the stove is so made as to ensure the flame being kept from impinging against its metal surfaces, thus depositing carbon, and also running the risk of so lowering the temperature of the flame as to form carbonic oxide, then there seems little reason for mixing air with the gas before burning, and thus losing the pleasing effect of the pure gas flame. The question then arises, in constructing these open stoves to burn sufficient gas to heat a moderate-sized room, Stettite tips would be a valuable addition to them, as they would prevent the conducting away of the heat of the flame. For larger rooms the air burner must be resorted to, or else the stove must be made of considerable size.

An "Otto" silent gas-engine is shown at the fair, by its makers, Messrs. Schleicher, Schumm, and Co., in operation. As the motor does not carry a load, the casual beholder, while impressed with its regularity and smoothness of action, does not get a correct idea of the work of which these excellent engines are capable.

The works of the Yonkers Gas Fuel Company are completed, and will supply gas at an early day. These works are built for the purpose of manufacturing Strong's gas, and it is proposed to furnish the inhabitants of Yonkers with a cheap and cleanly fuel. The progress of the Company will be watched with great interest by gas men. As I stated in a previous letter, coal gas at 1 dol. 25 cents (5s.) is theoretically as cheap for fuel as Strong's gas at 50 cents (2s.). However, it is unnecessary to dwell further on this topic at the present time, as I hope to revert to it on a future occasion.

There is nothing new to note in regard to the electric light. The Edison light may be what its friends claim for it—viz., the light of the future; it certainly is not the light of the present. Large electric lights are used considerably in the down-town warehouses in New York City, and in similar lighting in other large cities; and they are resorted to for exterior lighting by firms shipping goods at night, thus facilitating the loading of trucks. Gas would, however, be equally as efficient if freely used.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

One would imagine from the nature of the communication from "An Old Subscriber" published in the last number of the JOURNAL, and that from Bailie Cassels, which will appear in next Tuesday's issue, that I had set myself up as a special pleader on behalf of the Aitken and Young analyzer, and ought to be pinned at all points, whether as regards the merits of the machine, its price, or the places in or out of Scotland in which it had been used. At the same time, however, I am not prepared to intend to make upon the subject, I would disclaim all such special knowledge, and I would refer the gentlemen who make the inquiries to the patentees for fuller information. All that I know of the analyzer has been derived from articles in public prints, and from discussions conducted at Association meetings. Surely a correspondent is sworn in to be a source of review such subjects in the light in which they present themselves to his eyes, without being afterwards called on to solve all sorts of scientific and practical conundrums. However, in answer to "An Old Subscriber," I would state that I did not, in my communication of the 9th inst., make a "strong" remark as to the want of any special knowledge to analyze the Young analyzer by those connected with the gas interest in Scotland," unless, indeed, by an inversion of the well-known rule, Hamilton, the lesser, can be said to include Scotland, the greater. My observations had reference only to Hamilton, and I think I clearly established that the analyzer had been used in such a way in this town as to be a source of profit to the community. Unless "An Old Subscriber" is prepared to prove that the Committee of the West of Scotland Association were leagued together to publish and maintain a manifest untruth, he must, like a gentleman, accept their testimony as to the value of the analyzer. For the benefit of "An Old Subscriber" and "An Old Subscriber" to analyze my knowledge an analyzer was used by James Gibb, and was worked by Mr. A. Bell. In a letter published from that gentleman, dated Aug. 27, 1879, he mentions that the analyzer had been a complete cure for deposits of naphthalene; that it had increased the yield of gas per ton; and then he goes on to say "Formerly I used from 6 to 10 per cent of cannell until the month of May last, but I have since used the analyzer, and find it fairly to work. I had to go on reducing the proportions of cannell until the month of May last, when I stopped it altogether. From that day to this I have not used a single pound." This is some further positive evidence as against negative insinuations, and I need not dwell for a moment on the question as to which is more worthy the calm consideration of practical men. So much for "An Old Subscriber." Now with reference to Bailie Cassels, I confess I do not understand clearly his meaning in writing the communication which appears in another column. He asks, "Will our correspondent kindly inform us whether the Aitken and Young patent have introduced this admirable apparatus into their own works." The question is one which I am not in a position to answer, except in the true Scotch fashion by asking another. Will Bailie Cassels tell me how many gas directors and corporations have been influenced by the use of the analyzer, and how many have introduced it into their works? I consider the subject of the analyzer, without any special knowledge of its merits? At the same time will he also say how many gas managers in Scotland have the power to introduce such an expensive piece of machinery? While he is answering these queries, he may at the same time find it convenient to answer the question which the Aitken and Young analyzer has put to the analyzer, and the name of the person on whose report action was taken. In endeavouring to fulfil this programme the Bailie may arrive at a satisfactory answer to the question upon which he desires enlightenment. As to the other part of the query, I have yet to learn that any of the gentlemen speaking in favour of the analyzer are Directors of the Company. But assuming that some of them are so; does it necessarily follow that by becoming a director of a company a gentleman sacrifices all self-respect, and will put his name to a statement which he does not believe to be absolutely correct? The absurdity of such a proposition is so apparent to require any observation, and I have no need to say the other part of the query, dealing with Mr. Tainsh, the ex-Convener of the Gas Committee, I have nothing to say. I was not defending Mr. Tainsh. I was merely pointing out that he has had no satisfactory answer—in fact, none at all—to statements he has made with reference to the analyzer. At the very last step of the reasoning of the Aitken and Young analyzer, as being peculiar about the apparatus, Tainsh asserted that they had "destroyed the analyzer that was adding 6¢ candles with as much gas and greater durability." In the published report of the proceedings there is no answer to this statement. Why? Echo answers. The report in question certainly shows Mr. Tainsh to be in the minority alone. Although he was alone, he does not follow both the report and the balance-sheet which Bailie Cassels was kind enough to forward. The latter is headed "Profit and Loss Account in connection with the Hamilton Corporation Gas-Works for the year ending March 4, 1880." The first thing which strikes the eye in this particular document is that it is not signed by any accountant, and I am all the more astonished at this, considering the experience which Hamilton has had in the past. Then the first item in the print is, "Materials, manufacturing, maintenance, and repairs, as per printed abstract, 45955 7s. 5d." Without doubt the printed abstract, which Bailie has so far as these figures have no definite meaning, and so far as any rate the "test balance-sheet" does not speak for itself.

The Galashiels Town Council, on Monday, the 15th inst., rejected a motion to keep the street-lamps lighted after eleven o'clock, as extravagant. The extension of time was to cost £215 a year, against a year's saving of £100. Mr. Smith, of Peterhead, who has been Manager of the gas-works in that town since their purchase by the Town Council two years ago, has resigned his situation for a similar appointment in Heywood. The management of the works at Peterhead has meanwhile been entrusted to

Mr. Copland, for a long time former there, and it is said that in all probability he will succeed Mr. Smith.

The balance-sheet of the Aberdeen Corporation Gas-Works has been issued this week. Last year the revenue from gas was £41,066, and from residual products £2321 12s. 8d., while this year these figures have increased to £44,947 12s. 8d. and £2871 12s. 8d. respectively. It is very satisfactory to the Corporation that although the price of gas has been for two successive years reduced 1d. per 1000 cubic feet, the total return from the sale of gas is still moving upwards.

The Corporation of Montrose resolved on Thursday last to adopt and agree to a new Supply Act. The meeting was not altogether unanimous. It would appear that the subject of manufacturing gas by the Corporation has engaged public attention in Montrose for eleven years. Messrs. M'Crie and Blackadder, Dundee, brought out the structural value of the works to be £17,695, and the Council then offered some £25,000 for the Company. Bailie Hutchison, who is a Shareholder and a Director of the Company, said at the meeting on Thursday that the Directors were influenced by no consideration except what would be good for the interest of the community. He warned the Corporation, however, against the erroneous belief that as soon as the transfer was completed, the town would at once get cheaper and better gas. Mr. Durie was opposed to the motion—although he did not move an amendment—on the sole ground that the town was already burdened heavily enough. He said they had expended £13,000 on water, £13,000 on drainage, £4000 had been laid on their shore dues under the Roads and Rivers Act, and was proposed to add £28,000 to their already over-burdened backs. Mr. Durie does not seem to consider, in making these remarks, that there will be a handsome return for the expenditure. Mr. Mackie, amidst much laughter, said the Directors of the Company would be very stupid if they did not gladly meet the Council, and get quit of what might turn out to be a very bad property.

Thurso, as I mentioned in the JOURNAL of the 9th inst., was unable to keep its Gas Company in life. Since then it has been gasping for want of water—not that they have not a sufficient quantity in store, but because the main has in some way or other become choked. In Aberdeen they have succeeded in clearing the main, but some of the residents recently the inhabitants have been able to get fresh fish in the shape of eels along with their daily water supply. Within a short time three eels, each over a foot in length, have been taken from the pipes.

The town of Forfar seems to be in a bad state with reference to water. On the 15th of last week the Superintendent of Police gave in a statement showing that of the public wells in the town six were dry, six gave an intermittent supply, three gave a full supply, in two the water was scarce; in two there was plenty for the subscribers, and one has been shut up for years. The estimated population dependent on these wells is 9600.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

In connection with the appointment of Mr. Wilson, formerly of Saltcoats, as the new Manager of the Cambridge Gas-Works, I may mention that the Directors of the Gas Company have had the works and plant subjected to a formal inspection of the same, and to induce that gentleman to his duties. They were shown over the establishment by Mr. R. Mitchell, their late Engineer and Manager, and the inspection went to strengthen their previous expressed high opinion of the works, which were found to be in thorough order, and complete in every detail. In the afternoon Mr. Mitchell was entertained to dinner by the Directors—Mr. H. M. Lachlan, solicitor, in the chair. In the course of the after-dinner proceedings, the Chairman spoke of Mr. Mitchell in the highest terms. While in the service of the Corporation, the utmost harmony, he said, existed between him and his Directors, and in leaving them to fill a much more important situation under the Glasgow Corporation Gas Commissioners, as one of their station managers, he did so with their best wishes for his success. Mr. Mitchell replied in suitable terms, and stated that he had had great pleasure in comparing his service, and trusted the same kindly feeling which it had been his lot to enjoy would continue between the Board of Directors and his successor.

I have the pleasure of being able to state, for the benefit of many of the firms whose manufactures were shown at the late Exhibition of Light and Heating Appliances, &c., in this city, that at a meeting of the Executive Committee held on Friday, it was resolved that to all those exhibitors who had been or might be awarded first-class certificates by the various Committees of Jurors, there should be awarded medals specially engraved and struck for the purpose. A good deal of expense was necessarily incurred over this solution, but the Committee considered that the circumstances of the case fully justified them in taking such a step. Four of the Committees of Jurors have still to report the results of their adjudications.

The introduction of the electric light on a permanent footing into the sorting-room and telegraph office in the room of the General Post Office, Glasgow, seems to be now practically resolved upon. It is stated, on the authority of the Postmaster, that the lighting of one of the rooms has hitherto involved the consumption of 1000 cubic feet per hour, now selling in Glasgow at 6s. 6d.; and that far more work in the way of illumination is to be done by the electric light at an expenditure of only 6d. per hour. I cannot say how far this statement is to be believed, but the test of experience, as a chronicler of events I give it as I received it.

Mr. Miller, the lessee of the gas-works at Barlistown, has again lowered the price of gas by 6d. per 1000 cubic feet. Last year, when he came into possession of the works, gas was charged at the rate of 10s. per 1000 feet, and he immediately lowered the price to 9s. 6d. per 1000 feet. In the sequence of the two reductions, the charge is now 8s. 9d. per 1000 cubic feet.

A good deal of dissatisfaction is being expressed at the high price of gas in Strathaven. The gas which is not from the Strathaven and an excellent field of gas coal. Neither is it far from the town of Glasgow, and the charge for gas of good quality is now 4s. 7d. per 1000 feet, whereas for much poorer gas 6s. 3d. per 1000 feet is charged in Strathaven. It certainly seems strange that there should be such a disparity in the price allowed for the same quality.

It seems that we are by-and-by to have an exhibition in Glasgow of the domestic electric lamp lately brought forward in Newcastle-on-Tyne, by Mr. J. W. Swan, of that town. At the opening meeting of the Chemical Section of the Philosophical Society of Glasgow for the present session, the President, Mr. James Maclear, of St. Rollox Chemical Works, announced that he had arranged with Mr. Swan to visit Glasgow in the latter part of the winter, to show his lamp and give a lecture upon the system of lighting which he is said to have devised.

Whatever may be the ultimate result of the electric lighting movement in Glasgow, it does not seem to be affecting gas stock in a very detrimental way, for on Thursday last Glasgow Corporation sold £2000 of Gas Annuities, which were quoted at £222 10s. on the previous day, were advanced to £225, while buyers were still willing to invest in them at the latter quotation.

The recent heavy rains in Lanarkshire, Renfrewshire, Dumbartonshire,

Stirlingshire, &c., have for the present dispelled all the fear and anxiety consequent upon the imminence of a water famine. The inhabitants of the towns of Paisley, Greenock, Gourock, Ayr, Dumbarrow, Helensburgh, and Stirling can now breathe more freely, for in most cases there is a full supply of water available for the whole day long.

The price of one of our commodities in the Glasgow pig iron market, the fluctuations in price having been within moderate compass, and a good business having been done. Friday's closing prices were—Buyers, 62s. 4d. cash, and 62s. 6d. one month, and sellers very near it.

In the coal market there is likewise much steadiness, with an ordinary demand for house sorts. Prices continue firm.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Although there has been a slight slackening off in the demand for the better classes of round coal during the past week, this has had no effect upon the market so far as prices are concerned, the tendency of which is still towards increased firmness, the only sign of weakness being in engine classes of fuel, which are more plentiful, owing to the increased production of slack. Even in these, however, there is not as yet any appreciable giving way, the enlarged production having to a considerable extent been met by the extra requirements for marine purposes. A considerable amount of canal has been shipped to foreign ports during the last week or so, and good deliveries of gas coal have been made to home consumers on account of contracts, but there is very little new buying going on, and prices are nominally without alteration from those of a week ago.

Common classes of round coal for forge and iron manufacturing purposes continue only in limited request, and for these classes of fuel very little better prices are obtainable, except where they can be disposed of for house-iron purposes.

The average prices at the pit's mouth may be given about as under:—Best small Aisle, 6s. 10d. to 9s.; inferior sorts for domestic or gas-making purposes, 6s. to 7s.; Pemberton four-feet, 6s. 6d. to 7s.; common Wigan mines, for gas and manufacturing purposes, 5s. to 5s. 6d.; bulky, 4s. to 5s. 6d.; and good slack, 2s. 9d. to 3s. 3d. per ton. The pits generally throughout Lancashire are kept going about full time, and in some cases stocks are being built up, but not to a very great extent.

Lancashire made cokes are in fair demand at about late rates, ordinary local qualities averaging about 9s. to 12s. per ton at the ovens.

Not much actual business has been doing in the iron trade of this district, but generally there is a healthy feeling in the market, and makers, as a rule, although they could probably do a good deal of iron for forward delivery, are very cautious about committing themselves beyond the first three months of next year. Lancashire makers of pig iron continue to do a moderate business for delivery over the next three or four months, at prices averaging about 46s. 6d. to 47s. per ton, less 2½ per cent., delivered equal to 45s. 10s. to 46s. 10s. for the same period are quoted at about 45 15s. to 45 17s. 6d. per ton.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

The bad weather during the past week has materially interfered with the shipments of coal throughout this district, but at Cardiff there has been a greater falling off than at any of the other ports. Prices are gradually improving, and one by one sellers are raising their demands 3s. 6d., and in other cases 6d. per ton. In regard to the iron and kindred trades, very favourable reports are at hand. In many quarters development and re-opening are still going on, and this alone is a very encouraging fact; as a rule, although they could probably do a good deal of iron for forward delivery, are very cautious about committing themselves beyond the first three months of next year. Lancashire makers of pig iron continue to do a moderate business for delivery over the next three or four months, at prices averaging about 46s. 6d. to 47s. per ton, less 2½ per cent., delivered equal to 45s. 10s. to 46s. 10s. for the same period are quoted at about 45 15s. to 45 17s. 6d. per ton.

At the close of the week great satisfaction was experienced at Treglar in the iron, steel, and coal trades, more especially for steel, and sufficient orders are now in hand to last the winter. The shipments of rails for the Treglar district are expected to be very good during the year. Spain has contributed 3000 tons of rails, weighing 80 lbs. to the yard. At present the various specifications for rails are very numerous, and the immense quantities stowed away outside the mills, awaiting transit, are great, exceeding those ever before known in the district, steel rails being the most numerous. It is not probable that this important branch of industry is gradually assuming its old tone.

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There has been a fair quantity of tin-plate, dam, and bar iron produced throughout the district. All the tin-plate mills are in full work, and, if anything, a slight advance in prices has been realized. In pig iron the demand for grey has been more especially saleable at remunerative profits. Iron ore is imported freely, and much on the increase, and with very few exceptions blast-furnaces are at full work. Every other department connected with the various works is also in full employment.

All the collieries in connection with the iron-works show great activity, never losing one single turn, and at the Newport Abercrombie Colliery at least 100 more hands could be employed. There are several collieries in the Aberdare Valley prepared to receive something like 50 more hands at a moment's notice. I am not an official authority that no more orders will be booked at Cardiff at present prices.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the South Staffordshire district continues to grow bright, although the still room for improvement is not great. Prices generally have an upward tendency, but as yet but little difference has been made in the rates of any class. Household qualities are receiving the greatest demand at present, and for best deep coal the tone of the market is considerably the strongest. For all classes of forge and smelting fuel the demand is but a trifle slackened. Gas coals are also in good standing rates. Rough stock and other common sorts are slightly improving in value. Most of the collieries are considerably more active than they were a few weeks ago, and the tonnage raised for transit is of far greater proportion. Cokes are plentiful, and there is a fair demand at quoted prices.

The iron trade continues to improve, and prices for both raw and finished iron are considerably stronger. In fact, a more cheerful aspect pervades the markets, and a better class of orders are reported to be current. In some cases the prices of the finished material have risen as much as 2s. 6d. to 3s. per ton over those quoted a week ago. As compared with a few weeks since, the market for iron bars during any part of the last quarter there is a great contrast, and some few makers are refusing to take orders at the last quarter-day rates. Unbranded bars are also firm, and a lively demand exists. The ruling quotations are £7 10s. for best bars, and £8 10s. for unbranded kinds; though in a few cases 47, and even 48, are asked. Iron rails are in good demand, but the common sorts are difficult to obtain, and the prices ruling are £7 10s. to £8. Cable, hoop, strip, nail rod, and tip iron are all well inquired after, and prices are fully 6s. dearer. Pig iron and Staffordshire production is in better demand, and an increase of 2s. 6d. and 5s. per ton has been noted. The

better classes of pig iron are most looked after, and for all-mine, part-mine, and common cinder there is likewise a good existing inquiry at slightly increased rates. In some instances contracts of large dimensions are sought to be placed at average rates, but smelters seem inclined not to look for forward delivery on other than advanced rates. The export business is considered dull. In boiler plates, girders, and such like, trade remains unaltered.

YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The demand for coal for gas-making purposes is just now very fair, and at many of the Silkestone and thick-seam pits some good contracts are in course of being executed. The Wansboro' Park collieries are supplying a fair tonnage for Grimsby, Bedford, and Nottingham; whilst from Edmunds and Swaithe Main collieries a good quantity is being sent to Stamford and various places in the South. Hoyland Silkestone collieries are carrying very fair orders for the supply of the leading gas companies in the Midland district, including Nottingham and Derby. The quality of the coal raised at these and other pits in the district is securing a fair amount of trade, supplies having for many years been drawn from these collieries.

Unfortunately the steam coal trade is fast declining, so that the thick-seam pits are obliged to stack their "hard" in order to meet the demand for house coal. At some of the junctions in West Yorkshire and elsewhere a block is reported, although it is said that the best steam coal is offered in Hull at 6s. 9d. per 21 cwt. to the ton, without much response. The exportation, so far as the southern ports are concerned, having closed, the shipments are falling off, and the result is that the West Yorkshire district business is active, and with few exceptions full time is now worked. The same may be also said with regard to the collieries in the southern portion of the coal-field, from which a large tonnage is sent by rail to London and most parts of the Eastern Counties. In some instances supplies are nearly equal to the demand, but in others there is a deficiency of the hard and soft coal having to be won from the same seam, than from the inability of the firms to raise sufficient to meet their orders.

Other kinds of fuel are in only moderate request, except coke. The demand for nuts and small coal is nearly what it ought to be, and were it not for the consumption which the manufacture of coke entails, there would be great difficulty experienced with regard to the sale of slack. Most makers of coke are doing a large trade, but prices are lower than they were a short time ago, when the output was more limited. The quantities sent from South Yorkshire to the North Lincolnshire district is very large, about 15 out of the 18 furnaces erected in an area of 1000 acres being in blast. These consume a large quantity of both Yorkshire and North of England coals, the latter of which entails considerably more expense, both as regards price and carriage.

There is very little new to note with respect to the iron trade. The output of the Yorkshire and Lancashire works is pretty freely placed. Makers of Bessemer steel tires, axles, &c., are busy, but the general run of foundry work is very tame. There is not over much doing at the machine shops, but some improvement is visible with regard to wagon builders.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The Durham gas coal trade has been very active over the past fortnight, and a great deal of shipping business has been got through. The shipments of gas coals from the Tyne Dock have been very large. The exportation of coals of all kinds from thence, the greater proportion of which has been sent to the Continent, has been very brisk, but has been nothing but bad weather in November; indeed, gales of wind have prevailed for a month in the North Sea. The greatest difficulty has been experienced in keeping steamers up to their time, but notwithstanding this fact, the shipments of gas coals have been quite up to a winter's average. The Durham trade is a very important one, and has been a large business. The price does not alter. The house coal trade, which is intimately connected with the second-class Durham gas coal trade, is in a stronger position this winter than it has been for two years past. There is an active demand for households for shipment and also for local use. The best qualities have advanced in price fully 2s. a ton since September. Though there is no advance in the price of gas coals, nor is there likely to be this winter, the firmness which prevails in the house coal trade will prevent any reduction in the value of gas coals over the same period. The iron-works are taking up more manufacturing and small coals and coke than hitherto. There is a better business transacted in coke to be shipped to Spain and the Mediterranean.

The coasting business transacted over the last week or ten days has been large. All the small sailing vessels which had been wind-bound in the roads and bays between the Thames and Whitby, in many instances from a month to six weeks, have arrived in the northern coasts. They were needed, and most of the vessels which were in the market before-hand were quickly taken up. The coasting rates advanced considerably over the first two weeks of November. The freights paid sailing vessels last week were 6s. per ton to discharge afloat, and 6s. 6d. at the wharf in the Thames. The other quotations were—Dover, 6s. 6d.; Poole, 7s. 9d.; Exeter, 8s. 6d.; Teignmouth, 8s. 6d. per ton. Steamer rates to London for gas coals are 4s. 6d. and 4s. 7½d. per ton.

The loss of small sailing vessels usually employed in the gas coal trade coastwise, and of small foreign ships, in the gales of the past month upon the North Sea, is quite as disastrous as was anticipated in this column. Most of the ships were accounted for in one way or other, and total losses—and they are most numerous—there is quite a fleet of little vessels which are long overdue, which it is feared have foundered in the open sea, and will not be heard of any more. The loss, especially to the lesser gas-works in the South, will be considerable in this respect, as the ships were not to be replaced.

A quantity of gas-pipes were shipped on the Tyne last week for over-sea. There is a fair amount of work on hand at the foundries and iron-works in the manufacture of plant for gas-works. There is a general impression here that iron will increase in value next year, which is leading up to the speculation of that day, and orders in the market for the iron-works branch of industry alone—the iron shipbuilding trade—a considerable amount of business has been crowded into the market, and all the leading firms on the Tyne and Wear, and at Hartlepool, have as many orders in hand as will keep their yards fully employed until the middle of next year.

At this moment the fire-clay and fire-brick factories are slack of business, as is usual in the winter. The price of second-class goods is low.

The chemical market on the Tyne is dull in all departments. Prices do not improve, and the trade is without any animation. There is little or no change in the value of lead, copper, or metals of that description.

WESTGATE-ON-SEA GAS AND WATER WORKS.—The proprietors of the Westgate Estate have determined during the next four months to remodel the gas and water works supplying their district. The gas-works are to be enlarged in the manufacturing department, and all the most recent improvements in purification introduced; the stone-works are to be increased, and the result will doubtless be a reduction in the selling price. The water-works will have the engines and pumps duplicated, and large additions made to the adits. The mains are to be extended to Birchington forthwith, so that a pure water supply may be within reach of the inhabitants—a project never before enjoyed. The extension and alterations will be executed from plans prepared by the Consulting Engineer to the estate, Mr. William A. Valon, M.I.M.E., &c., of Ramsgate.

THE GAS AND WATER SUPPLY OF GOOLE.—At the meeting of the Goole Local Board, on Thursday, the 11th inst.—Dr. Bell in the chair—it was decided by four votes to one to accept the offer of Mr. Bartholomew, of Leeds, in respect of the gas-works belonging to the Aire and Calder Navigation. Mr. H. Woodall, valued the works at £30,000, and the Navigation asked £34,500, but reduced the sum to £33,000. Not satisfied, the Board called in Mr. Hulse, of Manchester, whose estimate was £31,588, subject, however, to £1516 being spent on the works in repairs and necessary alterations. This being about the same as Mr. Bartholomew's, the Board throughout represented the Aire and Calder Navigation in the matter, he undertook to lay out £500 in repairs—all he considered necessary—and to relinquish also the old material, representing £100 more. The Chairman of the Board, in moving the acceptance of this offer, pointed out the advantages that would result therefrom, and that it was not only a very increasing in value, but they would also solve the water difficulty, and obtain for the town such a supply as must result in a lessened death-rate and much less disease. They would further prevent any difficulty arising as to the sewage question, for they secured the best outlet they could get, but the very well-arranged system secured the Navigation had provided for their estate. To this motion Mr. Peacock, Mr. Bennett, and Mr. Boyd assented, speaking briefly on the great advantages the town would secure by its adoption. Mr. Hickman dissented from it on two grounds—first, that the value of the rates was excessive; second, that the trade of the town was so depressed that it could not bear extra taxation. The Board, however, as stated above, decided to accept the offer, and notices have in consequence now been given to apply to Parliament next session, on behalf of the undertakers of the Aire and Calder Navigation and the Local Board, for powers to establish a private Gas and Water Company, to be known as the Goole Gas and Water Board, the Navigation, and the general public. To this Company the Navigation will sell the gas-works at the price named, and the Company will proceed to supply Goole with water. The arrangement as to the sale of shares is, of course, a matter between the Goole Local Board and the Navigation only.

HALIFAX CORPORATION WATER SUPPLY.—On the occasion of the recent election of the Mayor and Aldermen of the borough of Halifax for the ensuing year, the following particulars respecting the Corporation Water-Works were given by the Mayor (Alderman Baintrow), in returning thanks for his re-election. He said: In 1864 there was a capital expenditure of £163,521; and an available supply of water of 474 million gallons, out of which 368½ million gallons were sold. The expenditure was £3870, and the income is said to have been £11,462, the income for each million gallons being £24 3s., or 5-79d. per 1000, and the waste 24 per cent. In 1871 we had a capital expenditure of £441,946—treble the capital nearly, and treble the quantity of water sold (nearly), and in 1876 we had not a sixth of double, being only 644½ million gallons. The expenditure was £25,582, and the income £90,832. The income per million was £15 4s. 5d., and per 1000 3-65d., and there was 52 per cent. of waste. The next period is 1878. We had then a capital expenditure of £583,463, the available supply was 2281 million gallons, the quantity sold 931 million gallons, the expenditure £42,000, the income £90,832, and the waste 112 per cent. million gallons, or 3-30d. per 1000, with a supply of waste. I will not dwell upon the figures for 1879, because it is not fair to deal with questions of this magnitude without you take an average of a number of years. The total loss at the end of 1878, which has been made up by rates in aid, was £87,500; and if you take interest upon the various instalments at 4 per cent. you will find that it makes an addition of £23,970, and the loss in 1879 was £9950. If the revenue increase at the rate of £1000 per annum up to the end of 1891, which is the period when we shall have done with our suspense account of £40,000, for which we obtained power of paying amount already in 1876, £148,969 must be added as additional cost, but not to value of works, thus adding to the original cost of the works £270,826. In the 14 years ending 1878 the increase in consumption has been 573 million gallons, or at the rate of 41 millions per annum, and it has been taken in the following proportions:—Trade, 94 millions; Local Boards, 19; domestic, 10. And as the rate of increase in the 14 years ending 1878, the increase has been 287 millions, or at the rate of 41 millions per annum, in the following proportions:—whilst trade took 94 millions in the average of 14 years, in the 7 years ending 1878 it took 123, domestic 23, domestic 123 against 41. In 1864, to sell 358 million gallons out of 474 millions, left a waste of nearly 33½ per cent. upon sales; in 1871, to sell 644 out of 1368, left a waste of nearly 112 per cent.; and in 1878, to sell 931 out of 2281, left a waste of nearly 146 per cent. The rateable value of the property of those who pump water for themselves amounts to £1400, and the income and the payable rate of 10d. in the pound, they were to pay over to us the value of that water, it would be something like £1300 or £1400 of increased revenue.

APPLICATIONS FOR LETTERS PATENT.

4683.—SEMMET, C. W., Westminster, "Improvements in gas-lamps." Nov. 13, 1880.
4733.—SEMMET, L. V., and SOLVAY, E., Brussels, "Improvements in apparatus for coking and distilling coal." Nov. 17, 1880.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ANNUAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.
4154.—HOWARD, J., WILSON, A. F., and KINODON, H. W. A., "Improvements in automatic apparatus for regulating the flow of liquids under pressure, and prevention of waste of water." Nov. 7, 1877.
4106.—HART, A. H., and POTTER, J. W., "Improvements in valves for liquid steam pipes." Nov. 1, 1877.
4217.—NABROCK, G. W. von, "Improvements in meters for measuring liquids." Nov. 10, 1877.

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TO CORRESPONDENTS.

D. H.—We cannot give you the information asked for. You had better make application to the firm you name.

R. H.—The information you ask for will be found on p. 384 of Vol. 2 of "King's Treatise on Coal Gas." The description of the mode of testing is too lengthy to re-produce here.—Use an efficient washer or scrubber.

CURRENT SALES OF GAS PRODUCTS.—Our attention has been called to the omission of a cypher after the decimal point when quoting, in the JOURNALS of the 9th and 20th inst., under the above heading, the specific gravity of the ammoniated liquor sold. The figures, of course, should have been 1.055, not 1.35 as given.

Notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 30, 1880.

Circular to Gas Companies.

THE continued existence of the London Gas Company as an independent organization, or its absorption into either or both of the two great Companies now supplying the larger part of London, north and south of the Thames respectively, is certainly one of the "burning" questions of contemporary Metropolitan gas policy. The position of the London Gas Company is geographically so peculiar, that its amalgamation by either of its two neighbours is attended with very considerable difficulty. The business of the Chartered Company is confined entirely to the north side of the Thames, while, consistently with its name, the district of the other amalgamating Company is purely South Metropolitan. That of the London Company, on the other hand, is broken into unequal sections, distributed over the Metropolis in an impartial but perplexing manner, regardless of what was, in the limitation of all the other Companies, accepted as a natural barrier. Indeed, it is very difficult to conceive what could have been the conditions which led the Company to retain so apparently inconvenient a territory, if it was possible, at the time of the general distribution of districts, to obtain, by arrangement with its many neighbours, a more compact

one. However the limits of this scattered district may have been determined, it has been efficiently served by the London Company, and there can be no question of disturbing their occupation on the ground of inconvenience caused by those adjoining or surrounding it. But the case is very different if we contemplate the absorption of the Company by either of its two great neighbours. The one effecting the union would, by so doing, not only perpetuate to the other the inconvenience at present impatiently borne, but would have it in its power to render a settlement of the Metropolitan Gas Question, except by the formation of one Company, practically impossible. It is inevitable, therefore, that, pending this consummation, not only would each Company object to the other obtaining such a power, but the Board of Trade would be unlikely to approve a scheme that would seriously interfere with their control over the future policy, or their power to determine the eventual settlement. For these reasons, among others, we believe that it would be waste of time for either the Chartered or the South Metropolitan Company, without mutual agreement, to negotiate an amalgamation with the London Company. No such union would be allowed to take effect, however well satisfied the parties to it might be with the terms agreed upon, without the fullest consideration of other interests. Practically determining as it probably will, at least for some time, the question of complete amalgamation, the issue is too important to be settled hastily, or without hearing all sides.

It has been an open secret for some weeks past that negotiations were afoot between the Chartered and South Metropolitan Companies on the question of further amalgamation. Rumour has not the best of reputations for veracity, but we believe it reports truly in this case, that the object sought in these negotiations is some equitable basis on which a joint offer may be made for the absorption of the London Company. The wisdom, if not the necessity for such an agreement, is sufficiently apparent. Efforts to deal singly would not only, as we have said, be likely to prove abortive, but they might put further difficulties in the way of a final settlement. The London Company seem to be embarrassed by an old perplexity; if not exactly prepared to be "happy with either" of the two alliances supposed to be open to them, yet their serious consideration of the claims or attractions of each is disturbed by the thought of the other. Competitive offers would both justify past dalliance, and invite a continuance of it.

We have already suggested that these negotiations may well open up the greater question of the combination of North and South into one homogeneous whole. It is impossible to imagine a conference on the subject of amalgamation between two bodies so well acquainted with its advantages as the Boards of The Gaslight and Coke and the South Metropolitan Companies, without such an issue being considered. We believe that the Chartered Company, when it adopted and as it developed the principle and policy of amalgamation, set itself no limitations. Every step thus far of that policy has confirmed its soundness, and it is therefore both natural and logical if the Company should desire to carry it through to completion. From this point of view the proposed division of the London Company, and the merging of the portion north of the Thames into the Chartered Company, while that on the south is joined to the South Metropolitan Company, deserves, and will no doubt receive, grave consideration. Such an agreement, if arrived at, will declare that no expectation whatever is entertained of the formation of one Company, but that the river is tacitly accepted as the natural division between the operations of the two. It is not our purpose here to discuss the relative advantages of one Company or more; much can be, and has been said, in favour of the continuance of two independent and, in a certain sense, competitive supplies. At the same time such rivalry, whether in the broad, gross sense, or when confined to the "competition of comparison" to be used before Parliamentary Committees or elsewhere, has always been to the detriment of the Companies. This moral has been so often and painfully pointed, that there is little danger of its being overlooked.

Returning, however, to the present suggestion of a joint offer to the London Company, there should be little difficulty in arriving at a fair basis. The respective values of the two divisions are readily determinable, and as the value of The Gaslight and Coke Company's "A" stock is nearly identical with that of the South Metropolitan Company's "B" stock, the Shareholders of the London Company would probably be equally content with either. To receive an equivalent in these stocks for the nominal value of their own, would be a

happy exchange for them, and at the same time would, we suppose, be readily offered. If the present large proportion of preference capital of the London Company is continued as preference, its value will be increased, because even in the Chartered Company, and following the several stocks already preferred, the proportions of ordinary stock guaranteeing it will be considerably larger than at present; while if, in deference to the wish of the Board of Trade to bring as much capital as possible within the operation of the sliding scale, it should be converted into ordinary stock, a fair equivalent would, of course, be given. Whatever may be the views of the Directors of the London Company as to the value of a guaranteed dividend on their ordinary stock, it is useless to discuss it here, because an amalgamation on such terms could not be approved by the Board of Trade without stultifying their repeated declarations in favour of subjecting all the capital possible to the inducements and terrors of the sliding scale. The disposal of the works of the Company may also possibly be an element of some perplexity. They are on the south side, while the greater portion—some two-thirds—of the consumption from them is on the north. The South Metropolitan Company intend next session to seek powers to erect new works at East Greenwich, and will certainly not surrender that intention even if they become possessed of the London Company's station at Nine Elms. The margin of producing power which they would have there, if the northern district were to be directly supplied by the Chartered Company, would meet the increase in South London for about three or four years only, and thus would simply give time to get the new station into working order. But we shall be greatly surprised if the Chartered Company are in a position to undertake an increased supply of some 1000 million cubic feet of gas per annum, in addition to their regular and enormous annual increase, from their existing plant. The natural solution appears to be that while the South Metropolitan Company retain the works, they should for some time to come supply in bulk to the Chartered Company the gas required for the northern districts, leaving to the latter Company the distributing of it. Although the works of the London Company are well placed, and in admirable condition, yet their value, as represented in the Company's capital, is so considerably greater than that of their equivalent erected now, and on such a site as the Greenwich marshes, that it is certain the Company taking them will require some share of this extra charge to be borne by that which takes rental only. Such questions as these will naturally require consideration by the two Boards, but they seem to present no great difficulty. If it is agreed that the effort shall be made to unite the London Company, not with one, but with both the others, then, it appears to us, all else should be easy. A settlement on this basis may not be the very best that could be arrived at, but it would certainly, for all the parties to it, be an improvement upon the *status quo*.

The annual report of the Administration of the Berlin Municipal Gas Undertaking, which will be found in another column, is, as usual, of a highly interesting character, and affords much information of value for the purpose of comparison with similar statements concerning our own undertakings. By similar statements we mean the fullest accounts obtainable of the contemporary transactions of English establishments. No English reports of the working of corporation or companies gas undertakings are comparable in wealth of detail to the exhaustive statements of German administrations, and it is this great distinction, as well as the particular facts mentioned in the Berlin report, to which we here wish to direct attention. On perusal of the report, it will be seen that every possible development of the subject, which can be brought into the domain of statistics, is carefully scheduled for comparison with the records of previous years; and the special numerical facts are, wherever possible, reduced to proportional expressions. In our own gas reports the efforts of the compilers in this direction seldom extend beyond bare statements of absolute increases or decreases in sales and returns, with perhaps the increase in the consumption of gas, and the amount of gas unaccounted for, shown in percentage relation to the previous year's accounts. Even this is not always done, but more than this is very exceptional. If we turn, for example, to the reports of the Directors of any Metropolitan Gas Company, or of any of the larger provincial undertakings, under corporate management or otherwise, it will be found that a few generalities as to having had a successful year or half year, as the case may be, leading up to the announcement of the proposed dividend, or to the declaration of the net profits, are all that, in most instances,

are considered necessary by administrations in the way of giving an account of their stewardship. But such is far from being the German practice, as the present example shows.

Here we have, to commence with, all that ought to be said on our system, but too often is not, by the Chairman in general meeting, when moving the adoption of the report, with the advantages that so much does not depend on the eloquence of the occupant of the chair, and that the explanations given of the causes that may have influenced business during the stated period can be made with greater clearness and force. Then we have all the circumstances of the consumption minutely set out, not only as to how much gas has been sold, but what proportions have been taken by various classes of consumers; sometimes—as is the practice of the German Continental Company—recording the quantities and proportions taken by the different trades, factories, railway companies, &c. The value of accurate returns of this kind, in showing how the gross consumption is divided, and, consequently, how the rental is contributed, cannot be gainsaid. Then we find the statistics of production dissected with equal minuteness. The actual quantities and ratios of the yearly, daily, and hourly manufacture and distribution of gas are noted, and made the bases of exhaustive comparison with what has gone before. As to the value of this, again, there can be no question, more especially as a gauge to be applied to the capabilities and necessities of the manufacturing and distributing plant. The carbonization of the coal used, respecting which so much has been written of late in our columns, is made no secret at Berlin. It will be seen that the rate per ton—10,117 cubic feet—is not excessive for coal which is said to yield its gas freely; and the fact that slightly over 9000 cubic feet per mouthpiece is the average daily production, shows that the management of the high heats produced by the generator furnace is in accord with the principles laid down by Dr. Schilling, and mentioned in another part of to-day's JOURNAL. Before leaving this part of the subject, it may be pointed out that as only 54 per cent. of the retorts at Berlin are heated by generator furnaces, it must be assumed that the rate of production per mouthpiece is higher for this portion than the average, in order to allow for the necessarily lower rate due to the remaining retorts heated on the old system. If this be so, the Berlin authorities must have been enabled, in some way, to surmount the difficulty of stopped pipes, supposed to be inseparable from a larger yield of gas than that herein given. In view of the observations contained in the report, it may thus be conceded that, in the matter of carbonization, the management of the Berlin Gas-Works takes a place in the front rank.

The remaining portions of the report speak for themselves. The pervading spirit of statistical analysis will be seen to be carried into the figures having reference to the mains and services, so that from year to year it is easy to follow the extension and development of the undertaking in every department, from the retort to the consumer's burner.

It may be said that the Berlin undertaking, being under corporate management, has the less reason to fear anything from a full publication of its affairs; but the same practice obtains, even more fully, as we have said, with the German Continental Gas Company, of which organization Herr Oechelhäuser is Engineer-in-Chief. In fact, the whole of the German and most of the French gas companies appear to revel in the publication of the statistics of their operations, as though their managers gloried in enlarging upon the development of the establishments they have official charge of. We confess to a desire to see this manifestation of pride in a gas undertaking, and the love of dwelling on the minutest details of its existence, more general in our own country than it has yet appeared. It is difficult to see what objections can be made, with any real weight, against a publicity that might almost be thought ostentatious. Gas companies do not carry on a secret industry, their emoluments are not hidden, and while the other elements that can possibly attract the cupidity or the animosity of rivals or enemies are made common property, it cannot be considered impolitic to publish other matters which must infallibly be of benefit to the profession, and indirectly to the community, while reflecting credit, it may be hoped, on those who have the control of the undertakings. None but bad managers, self-convicted, could object to their work being made generally manifest, and the convenience of such persons is hardly worth consideration. The Berlin Municipality have a good account to give of their gas-works, and they are not afraid to inform all the world of the fact. Are we so sure that in every case our own undertakings would bear to have such a blaze of light thrown upon their minutest details? It may be urged that the managers of works and their directors know all these things, and that no one

else has any concern therewith. We hope it is so, and that the picturesque treatment of statistics common to our Continental friends is not due in any way to their having the necessary facts more fully tabulated, and more constantly before them. It is certain that if British gas-works, with the infinite gradations of circumstances under which they exist, were to furnish annually, or semi-annually, detailed statistics of their structural and economical progress, so as to be susceptible of collation and analysis, in a comprehensive manner, by a national "Field," we should be put in possession of a better standpoint than anything we now have, from which to estimate the management of gas undertakings.

In continuation of our observations, in last week's "Circular," in reference to the notices of intended applications to Parliament in respect to gas undertakings in the forthcoming session, we may remark that the Hyde Gas Company make their appearance again as aspirants for extended powers. It will be remembered that the last Bill which the Company promoted was rejected. The present notice embraces the acquisition of lands, the extension of the Company's works, and the raising of additional capital. The Company also desire power to supply gas-fittings, and to make further provisions with respect to the supply of gas. The proposed Bill will affect the Hyde Gas Act, 1855, and the Dukinfield and Denton Local Boards Gas Act, 1877.

A re-commencement of hostilities is threatened from the Isle of Thanet. We have already referred to the proposal of the Thanet Gas Company to appropriate a certain district lying just without their limits of supply, and at present lighted by works in the hands of Mr. Davis, of Westgate-on-Sea. Mr. Davis has given notice of his intention to take the field again for the purpose of retaining the district he has practically made his own for some years past, so that a lively contest may be expected on the two Bills. If possession is as large a factor in this case as it is popularly supposed to be in common law, the Company may be expected to have some difficulty in proving their right to the desired territory, although Mr. Davis has perhaps experienced sufficient trouble in Parliament and also in the Law Courts to induce him to become rather weary of a position which he can only maintain by combat. It may, however, be expected that the coming session will settle the question, for one or both parties, for some time to come.

The Richmond Gas Company intend to apply for an Act to increase their capital, to enable them to extend their works and to acquire additional land. The Company also desire to construct a siding from the London and South-Western Railway into their works. It is intended to remove the testing-station for the Company's gas from the works at Mortlake to a site in the town of Richmond. The notice also contemplates certain alterations in the qualification of Directors, &c.

Application is to be made to the Board of Trade for a Provisional Order by the Brentford Gas Company, to enable the Company to raise additional capital, to define their district, and to acquire additional land. The Company desire powers to supply gas in bulk, and to be enabled to purchase the residual products of any other Gas Company for conversion, or to sell their own products to any other Company authorized to manufacture their own products, and to empower such Company to manufacture the same.

The gas supply of Lytham is about to be placed on a fresh footing—that is, if the Local Government Board consent to further the wishes of the Improvement Commissioners. Up to the present time it has been the practice to include the gas accounts in the general district accounts, any surplus from the revenue going to help the improvement rate. It is now proposed to keep the gas property separate, and the reasons offered at the late Local Government Board inquiry for doing so are instructive. Since 1878 the district under the control of the Commissioners has been greatly enlarged, a considerable area of a strictly rural character having been added by a Provisional Order obtained in that year. Under existing regulations the ratepayers of the added area are relieved at the expense of the gas consumers of the old district; and this has appeared to the Commissioners an inequitable arrangement, which they desire to have altered. The gas consumers maintain the works and pay interest on the capital sunk in the undertaking, and this should surely be enough without calling on them to pay farmers rates. In this case the Commissioners will probably succeed in attaining their object, as the question is propounded in a striking form. It must be a true principle that holds good in *minima* and *maxima*. There is no essential difference between the cases

of little Lytham and big Manchester, and there is no greater injustice in expecting a village gas consumer to pay rates for his country friends than in demanding from one citizen payment of rates due from his neighbour. Only in the one case the mistake is self-evident, and in the other it is too large to be seen. Still, those who cannot learn from the greater example may perhaps do so from the smaller, and may in the end come to acknowledge that one rule applies to both.

In two towns in Scotland an effort has been made during the past week to introduce the Burghs Gas Supply (Scotland) Act, 1876, and in both places the originators of the movement have been signally defeated. In the town of Kilsyth, which lies under the shadow of the Campsie range, and the total population of which is somewhere between 4000 and 5000, the local legislature has been terrified by the ghost of electric lighting, and so nervous, indeed, have they become, that they have resolved to delay consideration of the adoption of the above-named Act for six months. The local Company, therefore, have a lease of life for that period; but if dynamo-electric machines, and a practicable and economical method of distributing the element that is thus generated, are not perfected by the summer of 1881, the gas undertaking most assuredly will be found merged in the Corporation. The other town referred to is Helensburgh, where they have recently had quite enough to do in matters political and ecclesiastical. In this sea-coast town a movement has been long on foot to acquire from the local Gas Company the well-equipped works managed by Mr. Smith, and it was really anticipated that ere this time the works would have been in the hands of the Corporation; but those who have looked forward to the realization of such an event have been doomed to disappointment, for the Council, being equally divided as to the propriety of moving in the matter, the Act will not be adopted just now. There is, however, reason to suppose that this division does not represent the true feeling of the Town Councillors on the subject, and that it is the result more of the influence of local politics than of a feeling adverse to the adoption of the Act.

We continue this week our notice of the proceedings of the American Gaslight Association at their last meeting, by giving the discussion on Mr. Forstall's valuable paper on stoppages in ascension-pipes. The subject of the paper, so threadbare that only the boldest gas manager would willingly choose it as a theme for a discourse to his associates, afforded the author an opportunity of showing how attractive freshness of illustration and vigour of handling can make an old text. Mr. Forstall leaves very little to be said on the subject, which perhaps accounts for the somewhat pointless character of the subsequent debate, when nothing of striking novelty or value was elicited.

Mr. Davis's paper on the residual products of gas manufacture, read before the Manchester Scientific and Mechanical Society, on Friday last, and reported in another column, is rather entertaining. He treats the subject entirely from the point of view of the chemical manufacturer, and it will be a new experience for some gas managers to find how they are regarded by outside dealers in residuals. According to Mr. Davis, gas manufacturers frequently possess a diabolical ingenuity in deceiving the helpless purchaser of ammoniacal liquor and tar, by deteriorating the quality of these products for the sake of purifying the gas. This is certainly one way of looking at the question, and we were not prepared to be told that, in bargaining with manufacturing chemists, gas manufacturers always have the advantage. On Mr. Davis's showing, the valuation of ammoniacal liquor by degrees of Twaddell is invariably to the advantage of the seller. This is, at least, doubted in many quarters. In other respects, also, Mr. Davis's remarks are equally ingenious, and the paper shows an odd mixture of accurate knowledge and gratuitous assumption. As it appears by the author's own statements that he is no longer actively engaged in the trade in gas chemicals, his slight stumbles may well be pardoned for the sake of the generally interesting character of his present communication.

It is proposed to hold an Exhibition of Heat, Light, and Ventilation at the Alexandra Palace about the close of the present year. The project has only just been reduced to tangible form, and it is therefore impossible to foresee how it will eventuate. Gas heating and lighting apparatus will, in all probability, form the chief portion of the exhibits, although coal ranges and oil lamps will be equally admissible.

There is plenty of scope for a series of reliable tests of the relative efficiency of modern cooking ranges and gas stoves, and a discussion of the respective advantages of coal and gas for culinary purposes would be a positive relief from the unending controversy between the partisans of gas and electricity on the great lighting question. We wish the promoters of the scheme every success, which they will certainly attain if they can manage to endure their proceedings with any sort of novelty.

Water and Sanitary Notes.

The erroneous nature of the judgment pronounced on the London Water Companies by Sir W. Harcourt's Select Committee, is well set forth in respect to the Lambeth Water-Works Company in the report of the Directors, to be laid before the Proprietors at their half-yearly meeting to-day. In the case of this Company there is clear proof that Mr. E. J. Smith was right, and the Committee were wrong, in estimating the probable growth of the annual income. The increase of rental proves to be greater than was calculated, and 418 more houses have been laid on during the past twelve months than in any previous year. The extent to which the rates have been raised is shown to have no material effect in adding to the income, the addition from this cause in the course of seven years being only £3477, whereas the total annual rental now amounts to £154,000. The idea that the future capital expenditure of the Company would be at the same annual rate as in the past, is also shown to be fallacious. It is well argued that if this notion were true, then the Company who had laid out most money in perfecting their works, would be under the necessity of laying out most money in the future. The Lambeth Company have expended in recent years nearly a quarter of a million sterling in removing their intake to Molesey, and there constructing large subsiding reservoirs, building on suitable high ground capacious service reservoirs, extending the filtration area, and putting their works generally into an efficient state. But the Company having expended so much money, the Committee chose to consider that the same outlay must be repeated over and over again, and Mr. E. J. Smith was unable to make them accept his estimate. We must speak with respect of the Select Committee which sat last session; but the fact is that no Water Company could be right in the opinion of that Committee. If there was little expenditure on works, it would be assumed that the latter had fallen into a bad condition, and would require a larger outlay in the future. If, on the other hand, the works had been well cared for, it was considered that the expenditure in the future would be the same as in the past. Concerning the impolicy and injustice of introducing a competing supply by means of public funds, the Lambeth Directors speak very clearly and strongly. It is shown that the question is not one as to the existence of a monopoly. The Water Companies are in the position of private enterprises based on distinct Acts of Parliament; and "without prior compensation, Parliament does 'not permit public money to be used to compete with, and 'diminish the value of parliamentary private enterprise.' If this recognized principle were violated, 'there is no parliamentary Company which could not be annihilated by 'the use of public money in the construction of duplicate 'competing works—a railway company, for instance, by 'parallel lines—and no property would be safe.' Probably the time will come when the public will see the Metropolitan Water Question in a somewhat different light from that in which it was presented by the report of the Select Committee, and in which it has been viewed by the generality of journalists. The Press, with rare exceptions, has not done justice to the Water Companies, and the latter have also been made to suffer from the conflict of political parties.

The Metropolitan Vestries, while generally ready to agree that the Water Companies should be got rid of, are not so well able to decide as to who shall take the place of these corporate bodies. The other evening the Marylebone Vestry assembled in great force to sit in judgment on "certain 'persons who have been holding a conference at the Vestry 'Hall of St. Martin's-in-the-Fields, and adopting a memorial 'to the Secretary of State for the Home Department on 'the subject, purporting to represent the views of the several 'Vestries and District Boards of the Metropolis thereon.' A report was presented to the Vestry from a Committee who had been deputed to consider the subject, and in this report the Committee stated that while they were not at present prepared to recommend a definite plan for the constitution of a public body to take charge of the water supply, they felt it

their duty to "strongly deprecate the steps that are being "taken by a few Delegates of some Vestries and District "Boards" in pressing on the Government a scheme for the election of a "Water Trust" in a similar manner to that of the School Board. The discussion which followed appears to have been unanimously against the Delegates, who were condemned as usurping authority which did not belong to them, and as promoting a scheme from which the Marylebone Vestry entirely dissented. The report of the Committee was adopted, and was ordered to be sent to the Home Secretary, who will thus find that there are many "voices from the "crowd." This result agrees with our anticipation that the Vestries would not look with favour on the creation of an authority independent of themselves, and we are certainly surprised that the Delegates at St. Martin's-in-the-Fields so misunderstood the feelings of their constituents.

Mr. John Runtz is reported to have made an inexplicable announcement at the meeting of the Hackney Board of Works last week, to the effect that "in the course of a few "days a well-known firm of Parliamentary Agents would "give the statutory notices for a Bill for the creation of a "Water Trust for London on a representative basis." Messrs. Martin and Leslie would appear to have done as much as this, and a little more, prior to the utterance of Mr. Runtz at Hackney; in addition to which it is now rather late, though possibly not altogether too late, to talk about "statutory notices" for a Bill of this kind. At all events, if anything is to be done in the way proposed, the world must see some sign to that effect to-day. Perhaps Mr. James Beal and his friends are anxious to put in an appearance.

The Lower Thames Valley Main Sewerage Board are going to Parliament next session for an Act to authorize payment of the costs incurred by them in promoting their Bill of 1879. It might not be amiss if at the same time the Board obtained power to shorten their inconveniently long title. Concerning their costs, it seems to be a very common thing in these days for Boards to go beyond their legal powers in spending money. Either the law is stricter than formerly, or Boards are growing lawless. Surcharges, remissions, and Bills of Indemnity point to a lax and bungling way of transacting public business.

Notice is given of a very peculiar Bill to be promoted in Parliament next year. It proposes the incorporation of a Company to be entitled the "Manufacturers and Millowners 'Mutual Aid Association," the avowed object being "to provide means for giving practical effect to the measures "adopted by Parliament for preventing the pollution of "rivers and streams of running water by any noxious "matters, and for cleansing and utilizing the same." This highly beneficent scheme also includes the lending of money to local authorities to enable them to dissipate their rivers and utilize the refuse matter. Altogether it is a very odd notice, but as there is some allusion to a division of profits and a first charge on lands, revenues, and rates, we presume somebody expects to be the better for it. Parliament might at least be thankful if many other "Associations" were formed "to provide means for giving practical effect" to its statutes, especially those affecting the public health.

Considerable progress has been made during the past summer with the water-works now in course of construction for the Bradford Corporation. The Idle Hill reservoir, intended to hold a few days supply for the high-level service in the Idle, Eccleshill, and Bolton district, has just been completed, and is situated on the summit of a hill at an elevation of 745 feet above the sea level. It will hold 5,500,000 gallons of water. High-level works are also in course of construction at Thornton Moor, being the last instalment of such works for which parliamentary powers were obtained in 1872. An Act obtained in 1868 provided for the construction of two other reservoirs in the Oxenhope Valley—one at Stairs, and the other at Shady Bank—but it is said to be unlikely that these will ever be made, partly owing to the immense engineering difficulties which would have to be encountered, and partly because the storage capacity of the high-level service, when the works at Thornton Moor are completed, will be nearly sufficient to exhaust the drainage area. The reservoir at Thornton Moor is 1240 feet above the sea level, and has a storage capacity of 185 million gallons. The works connected with this part of the undertaking are very extensive. Barden reservoir, which is the mainstay of the low-level service, is situated seventeen miles from Thornton Moor, and has a capacity of 450 million gallons, but is utterly inadequate to impound all the available supply, and for two or three years past works have been in progress for the construction of another large storage reservoir in the same basin, about two miles distant.

WATER LEGISLATION FOR 1880.

HAVING completed our notices of the Acts in reference to gas supply which were passed in the last sessions of Parliament, we now proceed to give a summary of those relating to the supply of water. We shall commence with the Companies incorporated, of which there were two, as follows:—

The *Dearne Valley Water-Works Act* incorporates a Company for the supply of water within certain parishes and townships in the valley of the Dearne, in the West Riding of Yorkshire. The capital of the Company is £30,000, with power to borrow £7500 on mortgage. The supply of water is to be obtained by pumping, from a station situate in the township of Wombwell, whence a line of pipes is to run to a service reservoir in the township of Hoyland Nether. The Company take power to purchase by agreement six acres of land for offices or buildings only, in addition to the proposed sites of their stations, which they may acquire compulsorily. The works are to be completed in five years. Water may at any time be supplied constantly by order of the Local Government Board. Water for all domestic purposes is to be supplied at a rate not exceeding six per cent. on the annual rack-rent or gross rateable value of the premises, with additional rates for extra water-closets and baths. The Company may supply by meter water for other than domestic purposes, at rates not exceeding 1s. per thousand gallons for any quantity up to 50,000 gallons per quarter, and 10d. per thousand gallons for any further quantity. The Company may supply water in bulk to neighbouring sanitary authorities, provided that such supply can be afforded without detriment to the Company's domestic supply. The Company may also supply any water or sanitary fittings to persons using their water.

The *Portmadoc Water Act* repeals the Portmadoc Water Order, 1871, incorporates a Company, and vests in the Company the undertaking authorized by the said Order, and grants powers for the construction of additional works for the supply of water to Portmadoc and its vicinity. The Order now repealed authorized two persons to construct works and supply Portmadoc with water, with an expenditure of £8500. One of the parties sold his portion of the undertaking to three persons, who, with the other original undertaker, form the Company incorporated by the Act. The capital of the Company is £20,000, whereof £8500 is made original capital, and the remainder is the additional capital authorized by the Act. The Company may borrow £2125 on mortgage in respect of the original capital, and £2875 in respect of the additional capital. Dividends on the new capital are limited to seven per cent. on ordinary, and six per cent. on preference capital; all classes of capital to bear proportionately any decrease of dividend. The limits of supply include the parishes of Llandecwyn, Llanfihangel-y-Traethau and Llanfrothen, in the county of Merioneth, and Ynysybriarn, in Carnarvonshire. The Company may continue to use the water-works of the original undertaking, and may construct additional impounding and service reservoirs and lines of pipe, all to be completed within ten years. In addition to the lands to be acquired compulsorily, the Company may take ten acres by agreement. The supply of water is to be regulated by gravitation. For domestic purposes, water is to be supplied at the rate of 8s. 8d. per annum for cottages of less than £7 annual value; for houses of more than £7, but less than £30 rental, at the rate of seven per cent. on the rack-rent; and at 6½ per cent. on the rental of houses of more than £30 annual value. Additional rates are chargeable for any extra water-closets and baths, the latter according to size. The Company take powers for the supply of water in bulk, by meter or by agreement, and also to supply water and sanitary fittings to users of their water. The Company are compelled to supply water to vessels lying in Portmadoc Harbour, and to deliver the water on board at a rate of one halfpenny per ton on the registered tonnage of such vessels, no tonnage to be computed at less than fifty tons. Crown rights to minerals, and to the waters of the lake from which the Company draw their supply, are reserved.

Four Water-Works Companies obtained extensions of powers during the past sessions:—

The *Cardiff Water-Works Company's Act* amends some of the provisions of the Cardiff Corporation Act, 1879, and confers further powers upon the Cardiff Water-Works Company. In the Corporation Act, 1879, it was recited, among other things, that the Company had agreed to dispose of their undertaking to the Corporation on certain conditions; and it was provided that the consideration for the transfer was to be £300,000, to be commuted, by agreement, for four per cent. annuities or Corporation stock. Section 20 of the Act

contained a paragraph stating that the application of the purchase-money was to be as follows:—"In making a fair 'rateable division of the residue' (after all debts and liabilities had been paid) 'among the several persons whose 'names appear at the vesting period in the transfer books of 'the Company as proprietors of stock or shares in the capital 'of the Company, or their respective executors, administrators, or assigns, in proportion to their several shares and 'interests in such capital.'" It now appears that doubts afterwards arose as to the construction of this section, and the Company were advised that it did not bear the construction they desired, in order to apply the purchase-money in the manner contemplated at the time of the passing of the Act—namely, in a fair rateable division (after payment of debts) among the proprietors in proportion to the value of, and the dividend paid upon their stock and shares—but that the rateable division would have to be made in proportion to, and with reference only to the nominal value of such stock and shares. The present Act repeals the section in question, and substitutes a provision for the payment of compensation to officers and servants of the Company, and for the payment to proprietors of stock or shares of twenty-five years purchase of their maximum statutory dividends, and for the division of the surplus among the said proprietors in proportion to the amount of the capital paid up by them.

The *Exmouth and District Water Act* confers further powers as to capital and otherwise upon the Exmouth and Budleigh Salterton Water-Works Company. The Company were incorporated in 1864 with a capital of £8000, and power to borrow on mortgage £2000. The Company have constructed works in addition to and in substitution of portions of the works authorized by their Act of 1864, and have exceeded the capital powers then conferred, the sum of £2800 having been borrowed on the responsibility of the Directors. The district of the Company is revised by the present Act, to the exclusion of the district of the Budleigh Salterton Local Board, and the name of the Company is also altered. Certain works previously unauthorized are included in the Act, and power is also given to the Company to make certain extensions to be completed within five years. The Company are authorized to raise £20,000 additional capital, with which is included the £2800 borrowed by the Directors; dividends on this latter amount are to be limited to five per cent., and to seven per cent. on the remainder of the new capital, or five per cent. if issued as preference capital. The Company may also borrow on mortgage £5000. The Company take powers to sell or let meters, and to supply water and sanitary fittings to their customers; and also to sell water in bulk if they can spare a sufficient quantity from their ordinary domestic supply.

The *Great Yarmouth Water-Works Act* extends the limits of the Great Yarmouth Water-Works Company, and authorizes the Company to construct additional works, and to raise further capital. The Company were incorporated in 1853, and they have since been twice in Parliament, in 1857 and 1869, whereby their capital was fixed at £120,000 in shares and £26,000 on loan, of which £104,800 and £21,000 have been raised and borrowed respectively. The limits of supply are now extended to include parts of three parishes, the rates for water in which are not to be more than one-fourth higher than those charged within the former limits. The Company are empowered to raise £80,000 of additional seven per cent. capital, and to borrow £20,000 in respect thereof. The Company take power to make an additional line of pipes on certain lands, and passing under the River Bure, under several restrictions for the protection of navigation, &c.; the works to be completed in seven years. Clauses are inserted for the protection of the Crown property in the foreshore and Crown lands.

The *Wrexham Water-Works Act* enables the Wrexham Water-Works Company to make new service reservoirs and filter-beds, to extend their limits of supply, and to raise additional capital. The Company were incorporated in 1864, with a capital of £15,000 in shares and £3750 borrowed, with permission to raise, if necessary, a further sum of £6000 by shares and £1000 by borrowing. Again, in 1874, the Company were authorized to raise £20,000 in shares and to borrow £5000. All these sums have been raised and expended. By the present Act the Company's limits are extended to include a number of townships in the counties of Flint and Chester, and the Company may also open roads and lay pipes in the limits of the Brymbo Water Act, but not supply water therein. The Company are empowered to raise £60,000 additional seven per cent. capital, and to borrow £15,000. They may construct certain service reservoirs and filter-beds within ten years, and may acquire five

acres of land additional to their compulsory powers with respect to sites of their new works. The Company take power to supply fittings and to furnish water in bulk, if this can be done without interference with their domestic supply. The time fixed in the Act of 1874 for the completion of certain works is extended to ten years from June 30, 1880. A clause is inserted for the protection of the London and North-Western and Great Western Railway Companies.

In only one instance did a public authority seek for legislative sanction for the acquisition of a water undertaking during the past sessions:—

The *Rochester City Improvement Act* authorizes the transfer of the undertaking of the Strood Water-Works Company to the Corporation of Rochester in consideration of the sum of £6500, together with the costs of the Company, as agreed on, amounting to £350. The Corporation take powers to construct an additional reservoir and lines of pipes for the better supply of their district, to be completed within seven years, at an estimated cost of £4000. Water-rates are to be levied at different amounts, with direct reference to the rateable value of the property supplied, up to a rental of £40 per annum, beyond which the rate is fixed at five per cent., with the usual extras. The supply is not bound to be constant, unless so required by the Local Government Board. The Corporation likewise take power to supply water by agreement.

(To be continued.)

THE IMPROVED STREET LIGHTING AT BIRMINGHAM.

Our readers have already been made acquainted with what has recently been done to improve the lighting of the streets and open places round the Council House and Town Hall, Birmingham, and to-day we publish a plan of that part of the town where the experiment has been carried out with so much of success. The lamps shown by the black dots in the engraving are those originally arranged; but it has since been decided to extend the scheme so as to include the whole of Paradise Street. There will therefore be 85 lanterns used—viz., 42 singles, 11 triple-lights, and 2 five-lights. The lanterns, as has been already stated, have been specially designed by Mr. Charles Hunt, the Engineer to the Gas Department; and these are fixed to pillars supplied by Messrs. Hart, Sens, and Peard, of Birmingham and London, and are like those illustrated in the JOURNAL last March. [Vol. XXXV., p. 404.]

When the extension along Paradise Street is completed so as to employ the whole 85 lanterns, the annual consumption of gas will

be 6,376,000 cubic feet, as against 1,073,500 feet consumed in the 37 lanterns of the old type, burning from 5 to 10 feet per hour, which have been removed. The new lamps are now lighted up at dusk, and burn 30 feet of gas per hour until 11 p.m., or to a later hour if there is any meeting at the Town Hall or Council House which is not closed at that time. Afterwards, until the ordinary street-lamps are turned out in the morning, the consumption of gas is reduced to 10 feet per hour; while during the day a flash light is kept burning about a ½-foot of gas each hour.

As to the cost of repairs under the new arrangement, of course there has not yet been any experience in this direction; but it is not believed it will exceed the cost of repairs to the ordinary lanterns. The cost of cleaning, lighting, and extinguishing will necessarily be a little more than for the ordinary lamps, inasmuch as the men have to attend three times in place of twice to light and extinguish.

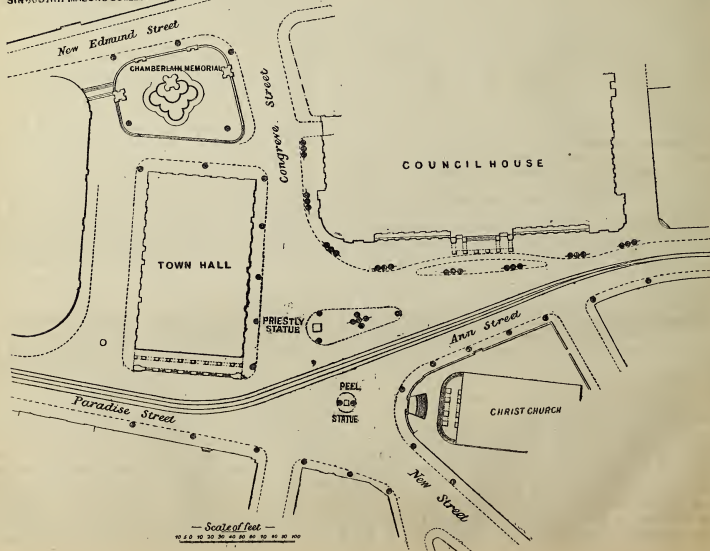
The illumination of the surrounding buildings, even to their summits, is a very noticeable feature in the improvements here referred to, the lanterns having very narrow ribs, and being made of clear glass throughout, except a small portion at the top, slightly larger than the corona. This is formed of opal glass, and serves to diffuse sufficient of the light, but not an undue proportion of it, to the base of the lamp-pillar.

GERMAN VIEWS ON CARBONIZATION.

Dr. Schilling, of Munich, has written on the subject of carbonization at high heats, with particular reference to the discussion still going on in our columns upon Mr. Livesey's recent proposition.* The remarks of the German Engineer are worth careful consideration. He lays down the principle that "the chief and perhaps the only advantage of high heats is a greater yield per mouthpiece, not an increased make per ton of coal." He agrees that by forcing the make, the illuminating power is diminished, and that there is a certain limit for the quantity of gas obtainable of a given illuminating power. If this limit be exceeded, cannel must be used to supply the deficiency of power, the corollary to which statement is the obligation to regulate the weight of coal carbonized in accordance with the heat of the retorts, so that the make may be kept within the proper limits, and the retorts yet maintained in full work. The hotter the retorts, the heavier the charges they will burn off. This is, of course, an elementary truth well known to every stoker, but Dr. Schilling adds the statement, by no means so generally credited, that the higher heat has no effect on the quality of the gas made, nor on the yield per ton. He might have said that the quality of the gas is in his case not altered by a higher heat in the retorts

* The letter was addressed to Mr. C. Hunt, of Birmingham, in response to his suggestion that Dr. Schilling might state, for the benefit of English gas engineers, the results of his experience as to the advantages of the employment of high heats in carbonizing.—ED. J. G. L.

SIR JOSIAH MASON'S COLLEGE



because the yield per ton is unaltered. Dr. Schilling states that at one time he used to obtain in 24 hours between 5000 and 6000 feet of gas per mouthpiece, whereas he now gets 8500 to 9000 feet without alteration in quality or rate of production, but simply by charging more heavily. He, in fact, has endeavoured to obtain a yield of 10,000 feet per mouthpiece in 24 hours, but he then fell into difficulties with his tar, which became practically pitch at the increased temperature. In consequence of the quickly carbonizing qualities of the Saarbrück coal, such as is principally used in Munich, and is said to excel Newcastle coal in this respect, Dr. Schilling has four-hour charges, having tried lighter three-hour charges without success; and he has no difficulty in making 9000 feet of gas per mouthpiece, although his tar is said to contain less light naphtha now than formerly. Nevertheless, he sells it as well as ever, and has no trouble with the naphthaline now present in the gas in somewhat greater quantity than before, having merely to exercise rather more care in condensation. Dr. Schilling is unable to give a scientific explanation of the changes due to high heats in the process of carbonization, as he confesses that the operation is very complicated, and that little is known about it.

So far Dr. Schilling is dealing with general principles. It is something to be informed, on such high authority, that no good gas may be made at extreme heats as when retorts are moderately worked, provided that proper precautions are taken, by loading the retorts heavily, to avoid excessive carbonization. But this only removes one of the extraneous doubts which might arise as to the wisdom of adopting high *versus* moderate heats. Inside of this question comes the other principle laid down by Dr. Schilling—that only a certain quantity of gas of a given illuminating power can be made from a specified coal, beyond which quantity the entire bulk of the gas becomes deteriorated. Gas engineers have long known that the last portions of a charge of coal give off a very inferior gas, and Mr. Livesey has perhaps done no more than connected the last portions of the charge, in a striking manner, with the higher figures of the yield per ton. But as this relation does not appear to be yet universally recognized, he has done well in attempting to bring the subject to a logical issue. He will have done better when he has completed his promised experiments with the object of confirming the deductions of logical reasoning by the evidences of observed facts. Argument will take us far towards the truth in this matter, for, reduced to its elements, the question may be put in this way: Granted that the last portions of a charge are bad, where should distillation stop to secure the best average results? This can only be settled by experiment with every kind of coal, in which all the derivatives of the coal will receive due consideration, and then the results of each investigation must be held to apply to the particular coal treated, and to no other. If the result of the present discussion should prove to be the establishment of a rational rule for carbonization, which, without reference to a fanciful standard of high and low production, shall depend simply upon making the absolute best in every way of the material put into the retorts, it will have conferred great benefit upon the profession and also upon the general community.

Returning to Dr. Schilling, after mentioning the aforesaid fundamental principles, he goes into particulars with reference to the means he employs for obtaining the high heats so much in favour with him. It is needless to say more than that Dr. Schilling's furnaces are worked on the regenerative system of gas firing. During the past summer and early autumn he used only 26½ lbs. of fuel to produce each 1000 cubic feet of gas, or 14·04 lbs. of coke per hundredweight of coal carbonized, with an average production in 24 hours of 8620 cubic feet of gas per mouthpiece. In 1878, on the old system of grate furnaces, Dr. Schilling used 21·8 lbs. of coke per hundredweight of coal carbonized, making only 6216 cubic feet per mouthpiece in 24 hours.

Dr. Schilling concludes by stating that, in his opinion and experience, high heats, corresponding with a production of 8500 to 9000 cubic feet of gas per mouthpiece in 24 hours, such heats being derived from generator furnaces, will, in England as in Germany, be found to offer the best and most economical means for the production of good coal gas. And in this opinion we are disposed to concur, with the further qualification that such heats must be intelligently applied and carefully managed.

Notes.

[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

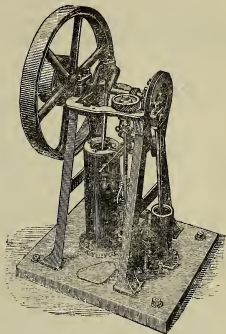
A NOVEL RETORT-CHARGING MACHINE.

Mr. George Rooke, of the Corporation Gas-Works, Nottingham, has invented an apparatus—called by him "The Breech Loader"—for charging retorts, and registering the charge at the same time. A moveable hopper, supposed to be kept full of broken coal, terminates in a vertical barrel which has three chambers in it somewhat similar to the chambers in a revolver-breech, each chamber containing a charge of coal. The hopper and barrel are, of course, above the path of the scoop. When the scoop is to be filled it is brought to an inclined position with reference to a vertical shaft, the point being lowered. One turn of the vertical shaft releases a charge of coal, which falls on an intermediate shoot, and is thereby directed to the rear of the scoop. The breech-end of the scoop is made tubular, and carries round it a cog-wheel rim. As

the point of the scoop is depressed while being loaded, the contents would fall out, but for a cover which at such times is laid over the top of it. When the scoop is full, and registered by the requisite mechanism, it is instantly brought to a horizontal position by lowering the breech, or raising the point, as the case may be, and the temporary lid being thrown back, it is wound into the retort by suitable gearing, being carried in a guide frame. When the scoop is entered to its full length, the cog-wheel rim before mentioned is turned by a pinion with which it is then geared, consequently reversing the scoop and charging the retort. The scoop is withdrawn by the reversal of the winding motion that drives it forward. The arrangement works well in the model, but it has not yet been tried on the manufacturing scale. It will have to be shown that the advantages of loading the scoop in the manner indicated are such as to compensate for the necessity of providing and working a moveable cover. It does not appear, moreover, that the inventor contemplates the use of power for his apparatus, and it remains to be proved that the labour of effecting the necessary motions is within the capabilities of manual labour. The apparatus is remarkably compact and simple in appearance, and as far as may be judged should be easily kept in order.

A NEW GAS-ENGINE.

Messrs. S. Clayton and Co., of Bradford, have recently patented a gas-engine of improved construction. The engine, as will be seen from the accompanying figure, is made with two cylinders, into one



of which a mixture of air and gas in a regulated proportion is drawn by the ascent of the piston. The mixture is driven by the down stroke into the second, or working cylinder, where, previous to being ignited, it is compressed by the descent of the piston. It is claimed that by this double process of compression the charge is very intimately mixed. The chief peculiarity in the engine is, however, the plan adopted to regulate the admission of the charge, in place of the usual slide-valve, which is replaced by a simple arrangement said to possess certain advantages. It is stated by the inventors that the slide-valve is a constant source of trouble, even in the best-constructed gas-engines fitted with it, on account of the difficulties attending its lubrication, excessive wear, and the loss of power caused by it. This loss is said to amount to upwards of 30 per cent. of the power actually developed by the engine. In this new engine a small portion of the charge is allowed to pass a regulating screw into a chamber, where it is ignited by a little external flame, when it is trapped in the chamber by the descent of an ordinary mushroom valve, and is afterwards passed into the working cylinder with the charge. The charge being thus fired, exerts its expansive power in the usual way upon the working piston. This arrangement is stated to require very little attention, and from the extreme simplicity of its working parts, to be almost free from risk of getting out of order. Messrs. Clayton and Co. had an engine of this class working at the recent Blackburn Exhibition of Gas Apparatus, where it appears to have met with much favour. The invention has been so recently completed that there are as yet no available data as to its performance in comparison with other forms of gas motors. The patentees claim to be able to get a superior duty from it, mainly on account of its liberating for actual work the power in other cases absorbed by the action of the slide-valve. Although shown as a vertical engine, the same principle may be applied to horizontal engines.

STEAM DOMES ON BOILERS.

In a communication published in the current number of the *Journal of the Franklin Institute*, Mr. W. Barnett Le Van treats of the weakening of steam boilers by cutting holes in the shell for domes and manholes. The author refers to a commonly received notion that the shell is weakened only in proportion to the size of the hole cut, and emphasizes the fallacy of this belief. When steam domes are specified for boilers, it is commonly provided that the space covered by the dome shall not be entirely cut away, but that holes are to be

pierced through the continuous plate, with the idea that by the latter procedure the weakening effect of the dome is materially lessened. The proper way of regarding the action of the dome is demonstrated by Mr. Le Van to be that of an appliance for subjecting so much of the shell as it covers to a compressive strain from without, equalling the tensile force acting from within. The result being that the portion of the shell so treated is deprived of its direct-acting tensile strength, which would otherwise be exerted in resisting an enlargement of the circle of the boiler, and has to exercise, in substitution of this action, the resistance made by a curved plate pulled in the direction of its chord. This transformation of duty is very evident on looking at the conditions of the case; there is nothing to keep the arch of the plate up when there is an equal pressure on both its outside and inside as under a steam dome, while the pressure of the steam exerted on the other portions of the ring tends to pull this particular arc of the circle into a straight line. To obviate this serious defect in the application of steam domes, whenever they are insisted on they should be connected to the boiler shell by a neck only, of much less diameter than the body of the dome. But Mr. Le Van disputes their utility *in toto*. He would take the steam from the boiler, in as dry a state as can be secured by the interposition of a dome, merely by a horizontal pipe carried along inside the boiler above the water, and perforated on its upper surface with a sufficient number of holes to correspond in area with that of the steam-pipe. By this means, similar to the device adopted in the construction of locomotive boilers, and also by ensuring in all cases that the steam-pipe between the boiler and the engine shall have a capacity exceeding that of the cylinder, the author of the paper states that steam domes may be safely dispensed with, not only without detriment to the dryness of the steam, but with positive benefit thereto, as also with advantage to the strength of the boiler.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

DR. ADAMS'S GAS STOVES.

SIR,—In the last number of the JOURNAL your correspondent, Mr. Denny Lane, writes as follows:—"The report of Dr. Adams and Mr. J. L. Bruce states that 51,300 of these new units of heat were utilized per cubic foot of gas." As I am the only person of the latter name who has (so far as I am aware) either tested or written about these stoves, it appears likely that I am the J. L. Bruce referred to. If this is the case, your correspondent must be under some misapprehension, as I have never made any joint report with Dr. Adams on his stoves, and indeed have never tested them, except on two occasions, the first, on an unfinished model in May, 1879, the results being published in a paper on "The Heating and Ventilation of Turkish Baths," read by me before the Glasgow Philosophical Society on the 30th of April of the same year; and the second on the stove in its finished form, made a few weeks ago for the adjudication on the heating stoves shown at the late exhibition of gas apparatus, &c., in Glasgow, and the result of which has not yet been made public. Your correspondent's misapprehension on this point is the more unfortunate, because I do not agree with Dr. Adams's new method of estimating units of heat, and wrote several letters to the late *Journal of Artificial Light*, proving them to be incorrect under certain circumstances. These letters and the Doctor's replies will be found in the issues of that *Journal* for March 27 and April 3 and 10, 1880. In the first of those numbers your correspondent will also find a calculation based on the Doctor's own figures, obtained, as I understand, from his own tests, showing that according to them his stove developed a heating power of 1314 units per cubic foot of gas—a result which I characterize as "most astonishing."

Whether this power is possible or not, it is impossible to say, because, unfortunately, we have no complete analysis of our Glasgow gas, and so cannot calculate what the ultimate theoretical heat power actually is. Your correspondent, however, is under the mark in stating the thermal units in canal gas at 700 per foot, as I myself have observed 850—a result which has since been so far confirmed by some tests made by our Gas Examiner, Dr. Wallace, in November of last year, which show, in a comparative form, the heating power of gas of various illuminating qualities.

With regard to your correspondent's remarks as to the merits and demerits of the Adams stove, I can, of course, in the meantime, say nothing, except perhaps to point out that he takes the specific heat of air as 0.237, whereas Regnault gives it as 0.2390, which I think is the usually accepted figure.

With regard to Dr. Siemens's stove, it seems to be another success, like most of Dr. Siemens's inventions; at the same time, it can hardly be called a gas stove, being neither free from ashes nor permanent, in the sense of practically requiring no attendance for the renewal of the fuel employed, as is the case with the ordinary gas stove so called.

I trust your correspondent's letter will bring out further information on the ultimate calorific power of coal gas of various qualities, as at present there is but little really practical information on the subject.

103, West Regent Street, Glasgow, Nov. 27, 1880. JOHN L. BRUCE.

[We are asked to state that Dr. Adams's reply to Mr. Denny Lane's letter, referred to in the above communication, will appear next week, being too late for insertion to-day.—Ed. J. G. L.]

UTILIZING THE WASTE HEAT FROM RETORT SETTINGS.—We have received a long letter from Mr. Alfred Upward, in reference to the paper read by Mr. Jolliffe before the North of England Gas Managers Association last month, and calling attention to the fact that many years since he carried out a similar idea when Engineer of the Chartered Gas Company at their Curtain Road station. What he did in this respect was alluded to in a paper "On Setting and Working Retorts," read before the British Association of Gas Managers in 1870, and published in the

JOURNAL, Vol. XIX., p. 485. Mr. Upward says that in 1850, when Engineer of the Curtain Road Gas-Works, he employed the waste heat from the retort flues for producing steam to work all the machinery then in use, which consisted of an apparatus for pumping clean gas from the Brick Lane station into the gasolders at the Curtain Road station, working the machinery for turning the wet lime purifiers, and pumping and heating. A short period after this date it was resolved to substitute clay for iron retorts; and this alteration necessitated the use of exhausting apparatus. About the same period the Company further resolved to construct their own water-works. A well between 400 and 500 feet in depth was therefore formed in order to obtain a good and abundant supply of water. This well was a perfect success, and supplied the works by means of three 7-inch pumps placed close to the surface of the water, and at a considerable depth below the yard. The then existing machinery was replaced with new plant, consisting of one of Mr. Beale's exhausters, three sets of five retorts, and two sets of five engines, which worked by steam heat from three sets of five retorts. One of these engines was used for working the exhausting apparatus, and other machinery in connection with the wet lime purifiers, &c. The quantity of gas pumped per day was between 500,000 and 600,000 cubic feet, against a pressure of over 24 inches of water. A second engine was employed for working the three 7-inch pumps to supply the works with water, causing a saving of nearly £400 per annum, which sum was formerly paid for water. The third engine was kept in readiness to provide for any emergency. Thus the whole of the steam machinery at the Curtain Road station in those days was driven by steam produced from the waste heat from the retorts. In 1852 the Directors appointed Mr. Upward to the double office of Engineer to the Brick Lane and Curtain Road stations, and having proved the success of his plan, he was enabled to induce them to carry out the same process at their Brick Lane station on a much more extended scale. In this case steam was supplied by three sets of five engines, two 20-horse and one 10-horse; and a new apparatus, so far as the steam-boilers were concerned, was ordered to be erected. These engines were most satisfactorily supplied with steam produced by the waste heat, and were all worked together during the four winter months of each year, exhausting the whole of the gas produced at the Brick Lane station, pumping water from a deep well to supply the works, and working the apparatus and pumps. The maximum quantity of gas pumped in this case was about 2 million cubic feet per day against a pressure of over 20 inches of water. As the process was found so successful at these large works, Mr. Upward resolved to try what could be done by employing it at smaller gas-works, where he was Consulting Engineer, and visited a large number of retorts employed was very limited. He has there carried out the plan with perfect success, and has proved beyond all doubt that, with a properly constructed apparatus, all the exhausting and other apparatus can be worked by steam produced by the waste heat from one bed of five retorts; thus showing that small gas companies may save themselves of a proportionate saving by using the method which produced such good results in the large works named. For more than 25 years past Mr. Upward has carried out this plan on works designed by him at home and abroad, with the addition of producing sufficient steam for working up the products as well as that required for working the machinery of the gas-works. It is at present erecting, for the Oldbury Local Board of Health, new gas-works of more than 50 million cubic feet per annum capacity, where sufficient provision will not only be made to exhaust the gas, and pump water, tar, and liquor, but also to manufacture the products, and to drive all the machinery required on the works, and this with only a limited portion of the waste heat produced from the retorts. In some of the instances in which this plan of generating steam has been applied, the furnaces have been placed at a considerable distance from the boilers, and in other cases the steam has been carried a great distance to the engines. This fact points to the possibility of disposing of the waste heat produced at gas-works to adjoining establishments, or selling the steam thus produced for driving machinery. In the course of his communication, Mr. Upward says: "I do not write this letter with any antagonistic feeling, but that, as I was undoubtedly the first to carry out with perfect success the plan of utilizing the waste heat for producing steam to work the machinery of large and small gas-works, it is only fair that I should have the credit of that which belongs to me. The waste of fuel and the economization of heat having become very important questions of the day, I hope that my plans for preventing waste, which have been so successfully carried out, may prove of some value to the public, and especially to gas companies, whose consumption of coal is so enormous."

THE USE OF OXIDE OF IRON IN GAS PURIFICATION.—Mr. J. Hall, of St. Andrews, N.B., sends us some interesting figures—which have been forwarded to him by Mr. T. D. Hall, the Superintendent of the Brompton works of the South Australian Gas Company—showing the saving effected by using oxide of iron in conjunction with lime for gas purification, in preference to the latter only. These show the following results:

Line used from May 1, 1877, to Aug. 31, 1878	16,900 bushels.
Do. May 1, 1879, to Aug. 31, 1880	4,590 "
Saving effected	12,310 bushels.
Number of purifiers charged during first period	143
Do. do. second period	58
Saving effected	85
Gas made during first period	125,538,200 cubic feet.
Do. second period	143,265,000 "
Increase in second period	17,726,800 cubic feet.
Gas purified per bushel of lime during first period, with lime alone	7,428 cubic feet.
Do. do., during second period, with lime and oxide	31,212 "
Line that would be required to purify gas made during second period at the above average—viz., 7,428 cubic feet per bushel	19,287 bushels.
Actual quantity used	4,590 "
Total lime saved	14,697 bushels.
14,697 bushels of lime, at 10d.	£126 2 6
Less 38 tons of oxide	112 6 8
Freight, &c.	177 15 0
	£434 12 6
Filling 85 purifiers, at £1 6s. 8d.	112 6 8
Total saving	£321 10 2
Average quantity of gas purified per bushel of lime (with oxide) for 16 months	31,212 cubic feet.
Average quantity of gas purified per bushel of lime for last three months	41,250 "
Note.—The oxide had been in use for 16 months up to Aug. 31, 1880, and had purified 143,265,000 cubic feet of gas.	

TUESDAY, Nov. 16.

Mr. Thomas Ward, Architect and Surveyor of Chesterfield, said he had been acquainted with the plaintiffs works and the River Hippier all his life. In the course of the present year, he made a survey through the Holm Brook connection with the main sewerage works of the town of Chesterfield, when gas tar and refuse appeared in layers below the bed of the stream. Those layers were about 2 or 3 feet below the bed of the stream. The cutting was made through the brook at the Old Forge Works. The Company gave up the Old Forge Works in 1856.

Cross-examined: The soil above the layers of gas tar was of a light sandy character. He had never seen any traces of tar in the stream at that place before the cutting was made.

John Higginbottom, foreman of the stokers and engine fenters in the employ of the Chesterfield Gas Company, said in 1879 Mr. Jones gave him instructions that nothing was to be sent down the river in connection with the new works. No tar was ever discharged from the gas-works into that drain.

Mr. R. T. Gratton, Chairman of the Chesterfield Water and Gas Company, said in February, 1879, he had an interview with Mr. Waterfield, who was connected with the defendant Company's gas-works. He asked Mr. Waterfield why he allowed tar, which was a valuable product, to be wasted, and that gentleman told him that the Midland Company had not sent tanks for the tar to be taken away in, in consequence of the frost having closed the canal at Derby, but that he had asked for some *debris* to be sent him in order to make a coarse sample. He visited the plaintiffs works after the commencement of the present action, and saw the attempt which had been made by the defendant Company to prevent the flow of tar into the brook, but it was only partially effectual, because he saw tar percolating in small quantities through the wall into the brook.

George Mowbray, a mason, said he was employed in the erection of a bridge over the Holm Brook about four years ago, and remembered coming upon an old drain, which was about three parts full of tar. In March, 1879, he found tar in the dyke, but not in the part nearest to the defendant Company's works.

Wm. H. Fletcher, a labourer, said he had resided near the defendants' gas-works for 21 years. He had seen tar in the river long before the Company's works were erected; and on many occasions, after floods had subsided, he had seen tar on the banks. In June, 1879, he dug in several places above the weir, and in most of them found tar. He was not engaged to do this. On one occasion he was employed by Messrs. Slack and Sons to clear out the basement of a house containing a lot of bricks and rubbish he found tar. There was six or seven years ago.

Wm. Bradley, Joseph Darley, and Henry Buckstone also gave similar evidence.

John Dove, a milk dealer, of Nottingham, deposed to having lived for 15 or 20 years at Chesterfield. Up to 1873 he had worked for the defendants' gas-works, and he knew the name of the plaintiffs. He washed, lined, and took the wool off the skins. Tar used to get on the skins when washing them. When water was in the dam, spots of many colours could be seen on the surface of the water.

Cross-examined: All the time he was with Mr. Mills they were inconveniently in the water. It was only when the skins were washed in the brook that they were brought into contact with tar.

George Tattersall said he had worked for Mr. Hopkinson. When skins were put in muddy water they were stained, but if the hair had not been taken off, the stains were easily removed.

Mr. DAVEY said he was a foreman at the Chesterfield Town Gas-Works up to Dec. 5, 1879, but was now Manager of gas-works in Ireland. On one occasion he was crossing the river and saw tar floating down. He at once went into the works, and found the spent liquor of tar had been running away. This accident occurred on the 15th of May, 1879. A similar accident occurred on the 19th of May, and the liquor was run off in the same way.

Cross-examined: On the 14th of June the drain became stopped up, and on opening it tar was found in considerable quantities. Assuming that large quantities had been poured down the drain in the yard, it would not be surprising to find the existence of the tar in the drain.

On the conclusion of the evidence for the defence, Mr. DAVEY said he did not dispute that the presence of tar in the water was injurious, or even that the tar was present during the years 1878 and 1879; but what he submitted was that the plaintiffs had not shown that the tar proceeded from the Midland Railway Company's works.

SATURDAY, Nov. 20.

Mr. DAVEY to-day concluded his address for the defence. He said his theory was that for years the dyke had been a receptacle for tar, and that it was lifted by the action of the water into the stream, which flowed into the river. The presence of tar was not due to a material escape from the defendant Company's works. The evidence in favour of this theory showed that the tar was present before their works were constructed, and that Mr. Slack's statement that tar was not discovered prior to 1878, was either from error of judgment or from strong partiality, not worthy of acceptance. Tar was in the river before defendants' works were commenced, and it was not his (Mr. Davey's) business to show where it came from.

Justice FRY, without calling upon Mr. Aston to reply, proceeded to deliver judgment. He said the defendants did not controvert the pollution caused by the plaintiffs, but they did raise the real controversy between the parties was as to the source of pollution. According to the story of the plaintiffs, a certain dyke having an outlet into the goit, was the source, and that down this dyke coal tar escaped from the defendant Company's gas-works. On the other hand, the defendants said the mouth of the dyke was closed many years ago, and that the water which washed the tar brought down from the upper portions of the stream, thus forming an accumulation of the matter complained of. In his (Justice Fry's) opinion it was proved that there were in the upper portion of the river considerable accumulations of tar, but where it had come from he could not say. The real question was whether this tar had flowed into the dyke. In order to answer this question satisfactorily, he must examine the evidence. The plaintiffs observed tar about the month of October, 1878, and they made frequent complaints to the defendants during that autumn and winter, and the early spring of the following year. The defendants for some time seemed to take no notice of the complaint. Stevens, who had charge of the works, said he never looked for, or made an examination in regard to the escape of tar until the drain was constructed in the spring of 1879. The defendants then made a fresh ditch in place of the old dyke. They took out the whole of the old soil, which according to the defendants was the only soil saturated with tar, and puddled up the end of the dyke. Therefore, the whole of the tar was removed, together with the soil that was impregnated with tar. This work was finished last year on the 27th or 30th of May; but there was evidence, upon which he placed implicit reliance, showing that tar escaped on several occasions through the old wall after it was completed, and after, the defendants would have him believe, every possible source of pollution had been removed. Several witnesses had spoken to this fact, the latter seeing tar ooze through on the 3rd of June. On the 13th of May the defendants works were visited by Mr. Slack and Mr. Allan, and upon some

Mr. William Stephens, Locomotive Foreman in the Midland Company's employ, said he had charge of the Midland Gas-Works at Chesterfield. The drain was altered in the spring of 1879, when a new siding was made. When the alteration was made he was present, but did not observe any tarry matter in the drain. When the leakage occurred he did not superintend the stopping of the drain. He received no complaints of tar escaping into the river before the leakage occurred.

Francis Woodall, foreman gas maker in the defendant Company's employ, also gave evidence.

Francis Glossop said he was employed by the Midland Company in 1878 to examine the tar and ammoniacal liquor tanks at the Company's gas-works at Chesterfield, in order to see whether there was any leakage. He said he had never before opened since it was laid. The Midland Railway Company commenced making gas at the end of January, 1878, and on October the 6th had manufactured 86,000 cubic feet. It was not true that an overflow drain was made from the tar-tank to the River Hippier. An overflow drain was made from the gasholder to the river. There was no outlet from the tar-tank except the man-hole at the top.

He replied: The water in the tank was so clear and pure that some people might could drink it. He should not like to drink the water himself.

Mr. Henry Woodall, Engineer of the Leeds Corporation Gas-Works, said he visited the defendant Company's gas-works at Chesterfield in May, 1879. He examined where the open dyke had existed for traces of tar, but did not find any. From that time he was engaged for a salary of about 150 yards, but there were no traces of tar or leakage. He went up the stream, and took out some of the mud from the bottom of the river above defendants' works. Tarry matter exuded from the mud. On stirring up the mud at the bottom of the river tarry films rose to the surface, but did not find any. From that time he was engaged for a salary of about 150 yards, but there were no traces of tar or leakage. He found the works exceedingly well constructed, and substantially carried out in every respect.

Cross-examined: He found the traces of tar in the river opposite the

mill-mill dam. He had been to the same places twice since May, 1879, but had failed to discover signs of tar.

Mr. John Goble, Surveyor, of Chesterfield, said he was Engineer for the Lower Brampton sewerage-works. In carrying out the works he cut across the Holm Brook in August, 1878. Excavations to the extent of 4 feet were made in the brook, and the whole of the material got out was saturated with coal tar. An excavation of a deeper nature was this year made across the river, and the character of the material was the same as was taken out in the first excavation. He had a hole sunk, and in a short time it was filled with pure tar.

Dr. Angus Mackintosh, Medical Officer of Health for the Chesterfield Union, said that in 1877 the River Hippier was polluted with gas tar and sewage matter. The Chesterfield Gas-Works were the cause of the gas tar being in the river at the time. He did not take any samples or make any analysis, and he judged it was polluted from its appearance.

Mr. Dyer, an Analytical Chemist, and Mr. Paton, the Permanent Way Inspector for the defendant Company, were also examined.

WEDNESDAY, Nov. 17.

Henry Harrison, a timekeeper in the employ of the defendants, said he remembered the Company making a bridge over the Holm Brook in 1875. Excavations were made, and in doing so they came upon a drain which communicated with the brook, in which large quantities of tar were found. The tar was not in communication with the river, in consequence of a small dam or damper being put in the drain.

Cross-examined: After the floods had subsided in June he saw tar on the grass, and had often seen tar about the gas-works, but did not take particular notice.

George Mowbray, a mason, said he was employed in the erection of a bridge over the Holm Brook about four years ago, and remembered coming upon an old drain, which was about three parts full of tar. In March, 1879, he found tar in the dyke, but not in the part nearest to the defendant Company's works.

Wm. H. Fletcher, a labourer, said he had resided near the defendants' gas-works for 21 years. He had seen tar in the river long before the Company's works were erected; and on many occasions, after floods had subsided, he had seen tar on the banks. In June, 1879, he dug in several places above the weir, and in most of them found tar. He was not engaged to do this. On one occasion he was employed by Messrs. Slack and Sons to clear out the basement of a house containing a lot of bricks and rubbish he found tar. There was six or seven years ago.

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Cross-examined: On the 14th of June the drain became stopped up, and on opening it tar was found in considerable quantities. Assuming that large quantities had been poured down the drain in the yard, it would not be surprising to find the existence of the tar in the drain.

On the conclusion of the evidence for the defence, Mr. DAVEY said he did not dispute that the presence of tar in the water was injurious, or even that the tar was present during the years 1878 and 1879; but what he submitted was that the plaintiffs had not shown that the tar proceeded from the Midland Railway Company's works.

Mr. SEGAR: My application is for you to order the Council to make a

reduction in the rents and charges for water for the year 1880 or 1881, as you shall see reasonable, so that the same shall be sufficient to defray the sum as near as may be equal to, but not less than the amount required for the purposes of the Act 10 & 11 Vict., c. 261, or any Act or Acts altering, amending, or extending the same, and any extraordinary sum which the Mayor, Aldermen, and Burgesses may be liable to pay in such year under the provisions of the said Act.

Mr. McCONNELL repeated his former objection upon the application as now definitely made.

The RECORDEER said it appeared to him that the question was too important to be decided without consideration. Of course, assuming that he should come ultimately to the conclusion that he had no jurisdiction to entertain this application at all, it would be utterly useless to expend a long time entering into elaborate arguments about figures. Therefore he did not propose to go on with this matter until he had made up his mind upon the question of jurisdiction. He might say, without committing himself, that his mind was a little favourably inclined towards the question. It struck him that if the framers of the Act of Parliament intended to repeal the elaborate provisions of the Act of 1847, they would have repealed them in the ordinary form. This was the sort of difficulty that was in his way, and he proposed to adjourn the whole matter to the next week, when he would be able to throw about the question. If he decided that Mr. Segar was entitled to go on with his application, he could then do so. He would also remark that it was perfectly open to the Corporation, if they thought it right, to go for a prohibition if they considered the question of jurisdiction was a very important one. It would also be open to the Corporation to move for a mandamus if they decided that he had no jurisdiction. He would do his best to decide the question of jurisdiction before the end of the present year.

The matter was accordingly adjourned to the next sessions.

Miscellaneous News.

THE BERLIN MUNICIPAL GAS UNDERTAKING.

ANNUAL REPORT OF THE ADMINISTRATION.
(Consented from the Official Statements recently issued.)

There has been no material alteration in the administration or working of the city gas-works during the year 1879-80 as compared with the preceding year. The dullness in all departments of trade which has now existed without interruption since 1873, and which at first did not materially affect the gas undertaking, has in the long run proved very unfavourable to the development of the works, in comparison with the extension in proportion to the increase of population observed in ordinary times. On the one hand, there are fewer new houses being built, and, on the other, bad trade necessitates economy, and the consumption of gas is reduced to the lowest possible limits. This is especially the case with small tradesmen, who in many instances have quite left off the use of gas in favour of petroleum, which is although less efficient, yet cheaper at its present low price. The proof of this observation is to be found in the decrease which has taken place in the past few years in the number of small gas-meters in use. Still, in spite of all this, the consumption of gas in the past year was slightly greater than in 1878-79. This goes to show that the use of gas is extending in private residences, and also for industrial purposes, which is also proved by the rising consumption of gas during the day.

The financial result of the year's working is very satisfactory, partly owing to the lower price of coal and the increased value of residuals, and partly to the working results, a higher yield of gas having been obtained, and greater economy secured in the accounts for fuel, wages, and other current expenses, as compared with the preceding year. Although the profits of that year must be considered unusually large, those of the past year were, owing to the circumstances above-mentioned, more than 25 per cent. more.

It should, however, be observed that when the wished-for improvement in trade appears, this state of things will be very much altered. The price of coal and other materials, and the value of labour, would experience a corresponding advance, and the profits would be lessened in consequence, without the possibility of making any change in the working to counteract the loss. Even the increase in the consumption to be expected in case of such a general revival of trade would only partly and slowly act as a counterbalance to the decrease of profit. It should therefore be remembered that the results of the two last years must by no means be taken as normal, and that equal profits are not to be always expected.

As already mentioned, the production of gas in the year ending April 1, 1880, was somewhat larger than in the previous year, being 61,871,000 cubic metres, as compared with 61,136,000 cubic metres, or an increase of 675,000 cubic metres, or 1.1 per cent. As the gas remaining in the holders on April 1, 1880, was 19,000 cubic metres more than on the same day last year, the consumption of gas was 61,852,000 instead of 61,175,000 cubic metres, or an increase of 1.105 per cent. In the year 1878-79 the consumption of gas was 0.21 per cent. less than in the preceding year, so that the increase in the past year as compared with 1877-78 was only 0.45 per cent. The increase in the number of burners was also considerable, being 6,374 in the year ending April 1, 1880, as compared with 6,374 in the year ending April 1, 1879, and in public lamps 11,991; together making 635,365 burners in operation, showing an increase on the previous year of 2.34 per cent. in public, and 1.5 per cent. in private use, the gross increase being 3515 burners, or 1.32 per cent.

The gross consumption of gas in the past year was thus divided:—

Public lamps	8,519,776 cubic metres	= 15.12 per cent.
Used in the works and offices	557,285	= 0.99
Private consumption.	47,253,705	= 89.80
	66,330,766	= 100.00
Unaccounted for	5,521,234	

Total 61,852,000 cubic metres, as previously stated.

The proportion of the gas consumed in public lamps to the total consumption was only 14.38 per cent. in 1878-79, thus showing a slight increase for the past year, and the percentage of private consumption diminished from 84.70 to 83.98 as stated. The average yearly consumption of a public lamp in a leap year is 718.965 cubic metres; but last year, owing to the addition of new lamps, it was 717.70 cubic metres, as against 714.85 cubic metres in the previous year. The increase is due to the additional day, in which the quantity consumed was 2.91 cubic metres. The amount of average consumption of the private burners was slightly more, being 76.27 cubic metres as compared with 75.70 cubic metres.

The loss of gas by leakage, &c., has increased by 329,336 cubic metres during the year, and equalled 8.93 per cent. of the total consumption, as against 8.45 per cent. in the preceding year, showing an increase of 0.44 per cent. When the great alterations in the mains, and on account of the new paving of the streets, are considered, this increase does not appear great.

The greatest production of gas on any single day of the year was on

Dec. 22, 1879, when the four works made together 292,500 cubic metres of gas, the maximum of the preceding year for similar purposes having been 280,500 cubic metres. The minimum production was 75,100 cubic metres, on July 2, 1879. The greatest consumption during seven continuous days was from Dec. 17 to Dec. 23, 1879, when 2,020,900 cubic metres of gas were used. This is 44,500 cubic metres less than for the similar period of the preceding year, partly owing to bad weather, and partly to finer weather, only one of the seven days having been foggy. The greatest consumption in one day was on Saturday, Dec. 20, 1879, when 317,000 cubic metres were consumed, an increase of 3.93 per cent. on the heaviest day's consumption of the previous year, due to bad weather. The maximum consumption in one hour on this occasion was 35,100 cubic metres, between five and six p.m. In the preceding year the heaviest hourly consumption was 37,250 cubic metres. The smallest day's consumption was 66,300 cubic metres on June 29, 1879, as against 65,300 cubic metres for the lowest of the preceding year, or an increase of 1000 cubic metres. Consequently, during 1879-80 the proportion between the minimum and maximum daily consumption was 1 to 4.77, as against 1 to 4.67 in the previous year; between the maximum daily consumption and the total yearly consumption the proportion was 1 to 195.1 as against 1 to 200; and between the maximum hourly and daily consumption it was 1 to 9.4 against 1 to 8.18 in the previous year.

The quantity of gas produced from the coal carbonized, great as it was in 1878-79, was last year still more considerable. Although there was an increase of 675,000 cubic metres in the gas made, the quantity of coal used was only 216,058 tons, or 155.2 tons less than in the previous year. The use of the coal was, therefore, a moderate saving, and it is to be noted; thus maintaining the steady improvement observable since 1876-77. This favourable result has been due to various causes. The quality of the coal has materially contributed to it, the coal from the Königin Luise pit, and also from Westphalia, having been especially excellent. This is probably due to the fact of their being better sorted, and the coal from the pit in screening the coal, and also, in the former instance, of an unusually good seam being now worked. The better quality of the fire-bricks used in the settings, the use of gaseous fuel, and greater skill on the part of the stokers, may also have contributed towards an increased production of gas. To the last named circumstance may especially be attributed the increase in the yield of gas per mouthpiece, from 24.2 cubic metres (5649 cubic feet) to 26.88 cubic metres (1935 cubic feet). There has been a corresponding reduction in the number of retorts in daily use, and in the number of charges, in spite of the increased production of the whole year. In the past year there were 36,410 cubic metres (1,055,044 charges), and in the previous year 1,430,317 charges. The greatest number of settings in action on any one day was on Dec. 23, 1879, when at the works 168 settings, with 1162 retorts and 6972 charges, were recorded; the corresponding numbers for the preceding year being 174 settings, with 1236 retorts, and 7182 charges.

During the year the alterations from grate firing to generator firing were further proceeded with. Of the total number of retorts in use, there were 129,815 retorts, or 54 per cent., fired with generators, the percentage of the previous year being only 47. In consequence of the high and uniform temperature of the generators, the experiments with the use of burning eight and nine retorts in a bench instead of seven, as before, and the results have been satisfactory. As the extra retorts necessitate an alteration in the arches, they can, however, only be introduced gradually, as the benches need rebuilding.

The quality of the gas has been almost uniform throughout the year, according to tests made daily by Professor Rildorf in the middle of the city, and published weekly in the official gazette. The illuminating power with an hourly consumption of 150 litres (5.295 cubic feet) was, on an average of 307 observations, equal to 17.2 English sperm candles. The maximum of 16 candles occurred four times in the year, and the minimum of 16.5 candles only twice. The tests made daily at the gas-works also gave corresponding results: The gas was always free from sulphuretted hydrogen, and the percentage of carbonic acid, ammonia, and sulphur in other forms than sulphuretted hydrogen was very inconsiderable.

As regards an improvement of the manufacture at any of the stations during the year, and in consequence of the small increase of the consumption no extensions have been necessary; but at the Gitscherin Street station an adjoining piece of land has been acquired for the purpose of widening the coal stores. The following renewals have been executed at the various works:—At Gitscherin Street the old retort-house, built in 1845, for 15 retorts, has been pulled down, and a new boiler-house and stack have been erected on the site. Gasholders Nos. 1 and 2 have also been extensively repaired. At the Müller Street station, two gasholders also had to be repaired, and No. 3 retort-house, for 10 settings, has been pulled down, and the foundations of settings of 9 for generators have been rebuilt; the tar and liquor wells were also rebuilt. At the Griefswalder Street works, two retort stacks, each of 12 settings, were arranged for gas-firing, the old arches being utilized, and one generator being made to serve two settings. At the gasholder station in the Kopenplatz, arrangements had to be made for carrying on the supply of the Royal Opera, &c., formerly served from George Street, the site of which is to be given up to the city railways. Sundry extensive works of distribution, necessitated by the last-named alterations and otherwise, were carried out. The total length of the mains laid during the year was 27,702 metres, and of the mains removed 17,759 metres. The total length of mains, which on March 31, 1879, was 543,165 metres, had, on March 31, 1880, increased to 570,867 metres, an increase in the year by 9943 metres, or 1.81 per cent., and was consequently on March 31 last 558,108 metres. In consequence of the laying of pipes of larger diameter, the cubical content of the pipes in the city has been increased by 9.08 per cent., having risen from 22,554 cubic metres on the last day of March 1879 to 24,266 cubic metres on the corresponding day of the present year. Only an inconsiderable number of new services were laid, on account of the diminishing number of houses built. Only 491 new supplies of gas were entered, and 164 services were cut off or taken away. [The price of gas to private consumers in Berlin is 16 pfennige per cubic metre, equal to about 4s. 6d. per 1000 cubic feet.]

SALE OF SHARES IN THE VICTORIA (NEWARK) GAS COMPANY.—On Tuesday last, Messrs. Feist and Son offered for sale in Norwich 28.45 shares in the above Company. They were put up in six lots, four of five shares and two of four shares, and realised the following prices:—Lot 1 (5 new shares), £26 lot 2 (4 new shares), £58; lot 3 (4 shares second issue), £42; lot 4 (5 shares, third issue, £3 10s. paid), £30; lot 5 (5 similar shares), £34; lot 6 (4 shares) £26.

INDICTMENT AGAINST A WATER-POWER COMPANY.—About two years ago a bill was introduced into the House of Representatives for the Extension of Useful Manufactures, of Paterson, New Jersey, U.S.A., for not properly fencing in their raceways in the streets of the city. The indictment was carried to the Supreme Court, and this body has recently decided that an unguarded roadway is *per se* a nuisance; but, as the indictment did not specify that the streets existed before the raceways, that fact must be established on the trial. As a point of fact the Society claims that the raceways were built 70 or 80 years ago, long before the streets were laid out.

ORIENTAL GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held on Friday last, at the London Offices, 14, St. Mary Axe, E.C.—JAMES SYDNEY STOFFORD, Esq., in the chair.

The SECRETARY (Mr. A. Horsey) read the notice convening the meeting, and the following report of the Directors was taken as read:—

In submitting the accounts for the twelve months ended on the 30th of June last, the Directors have to report continued satisfactory progress in the Company's operations. The number of public lamps added during the year was as follows:—582 in the town of Calcutta, 91 on the Midlan, 31 in the suburbs, 16 on the canal bridges—total 726; thereby completing all orders at present received. The several new contracts for street lighting are now in full operation. Very liberal concessions have been made by the Company in the expectation of commensurate advantages hereafter. The proceeds of the Calcutta lighting rate for the past year did not prove sufficient to induce the Corporation to give the anticipated order for additional street-lamps, but it is hoped this will not be long delayed.

In private lighting there has been the addition of 198 consumers and 3080 burners. The extra consumption of gas by meter is encouraging, but the large increase of lights has not yet yielded to the revenue as might have been expected. The addition of 19 miles of new mains was laid during the year, and the Directors are pleased to state that, notwithstanding this additional length of pipes, the leakage has been considerably reduced.

Satisfactory contracts have been made for a full supply of coal for a period of three years.

The recent extensive provision of new plant and machinery has proved most serviceable, and the works are reported to be in excellent condition.

The Directors have still to regret the unfavourable state of exchange, with its effect upon the profits. It is feared that no further improvement can be expected.

The members of the Resident Committee have at all times given their best attention to the Company's interests. Mr. R. C. Noble has retired from India, and the Hon. J. B. Esq. has been elected in his place. The Directors have pleasure in again bearing testimony to the valuable services rendered by the Manager, Mr. Blackburn.

The general revenue account shows a balance (after crediting £2500 to the reserve-fund) of £19,390 12 2 out of which the Directors recommended a distribution of 5 per cent. free of income-tax, payable on the 4th of December next, making, with the interim payment of 1 per cent. on the 4th of June last, a total dividend of 9 per cent. for the year.

The Directors who retire by rotation are Henry M'Lauchlan Backler and Charles Hill, Esqrs. The Auditors, Henry Lawrence Hammett and Thomas Newton Stokes, Esqrs., also retire. All are eligible for re-election, and offer themselves accordingly.

Dr. Balance-Sheet, June 30, 1880.		Cr.	
30,900 shares of £5 each	£150,000 0 0	Amount of plant on the 30th of June, 1879	£317,026 1 9
30,000 " " " " " " " "	150,000 0 0	Outlay during the past 12 months	9,833 7 10
15,000 " " " " " " " "	75,000 0 0		
Loans on debentures	£23,000 0 0		
Reserve-fund	£37,185 0 0	Cost of plant to the 30th of June, 1880	£326,879 9 7
Unclaimed dividends	635 6 2	Services laid and meters in use	10,702 10 8
Amount due by the Company	5,935 18 2	Amount due to the Company	7,769 0 8
Balance from general revenue account	19,390 12 2	Value of stocks, viz.—	
		Purifying material	£435 16 2
		Coal	301 0 8
		Products	691 12 5
		Fittings and meters	3,419 10 9
		Pipes	3,710 0 4
		Horses, conveyances, &c.	469 10 0
		Retorts & fire-clay goods	2,845 9 3
		Sundry stores	4,432 1 11
		Office furniture, &c.	360 19 0
		Cash in Calcutta	19,017 0 2
		Cash in London	1,562 10 0
		Bank bills in hand	6,000 0 0
	£395,237 16 11		£395,237 16 11

Profit and Loss, or Working Account, for the Twelve Months ending June 30, 1880.

Manufacture and Distribution—		Gas-rental	£34,696 18 4
Coal, purification, and wages	£20,762 8 1	Coke, tar, fittings, &c.	17,438 1 11
Salaries in India & London	3,343 3 3	Transfer fees	31 0 0
Directors and Auditors	213 0 0		
Passage & general expenses	1,681 7 2		
Exchange	5,750 9 9		
Reserve-fund	1,985 0 0		
Wear and tear and repairs	2,057 16 10		
Retort account	1,016 4 0		
Deposits and allowances	23 0 0		
Balance	32,180 7 9		
	£74,164 0 3		£74,164 0 3

General Revenue Account.

Dividend of 5 per cent., balance of 9 per cent. for the twelve months ending June 30, 1879, declared at the gen. meeting, Nov. 1879	£12,087 10 0	Balance on June 30, 1879	£17,338 5 9
Interim dividend of 4 per cent. on account of year ending June 30, 1880, paid June 4	11,100 0 0	Dividend on June 30, 1880, on account	£3,130 9 7
Interest on debentures	3,313 2 7		
Income-tax	588 8 4		
Reserve-fund	2,590 0 0		
Balance	19,390 12 2		
	£49,519 13 6		£49,519 13 6

The CHAIRMAN, in moving the adoption of the report, said it would probably be remembered by the Shareholders that when he addressed them this last year the Company's position was very bad indeed, preparing for the new contracts, in laying mains, erecting lamps, &c. He was now happy to say that everything was most satisfactorily completed by the time specified in the contract—viz., the 1st of May—and the new arrangements were started without drawback in any respect. He must point out that the accounts for the present year were somewhat more favourable than they would be under ordinary circumstances, for the Company received the rent of the old lamps up to the 1st of May at the original rate, and in addition to this they had received rent from the new lamps, many of which were ready before the time specified, and the Calcutta Corporation ordered them to be lighted. He mentioned this because the accounts for the current year would bear evidence of the liberal concessions the Company had made to get the contract, and the full strain of the reduced rates was now being experienced; but still the Directors felt that there was cause for great gratification in the knowledge that the Company's position was now secured for the next 21 years, and there was every ground to hope that the present prosperity of the undertaking would be continued. Under the provisions of the new contract, the Corporation had power to erect 500 new lamps in addition to those ordered at the time. In the last Budget 100 of these lamps were included as likely to be lighted immediately, but he was sorry to say that the lighting-rate fell short of what the Corporation expected, and the order for the lamps was not given. However, the saving to the Corporation was so great under the new contract that he had no doubt they would very soon order this number of additional lamps to be lighted. He was happy to inform the Shareholders that after the experience of the last year, he believed the Directors had found no difficulty whatever in working according to

the terms of the new contract. Everything had been done without a hitch, and to the satisfaction, as the Directors knew, of the Corporation. The extension of the Company's works into four districts had brought them a great many new customers, the number of burners added exceeding that of any previous year, but these were taken by natives, who were not regular consumers of the gas. They did not burn it regularly, and therefore this revenue did not benefit the Company so much as might be expected. The natives were glad to have a native customer, even though their consumption was only intermittent. The progress of private lighting in Calcutta during the year had been very satisfactory, the receipts being about £900 in excess of those of last year, which was about 51 per cent. on the previous twelve months; but Howrah, he regretted to say, did not help at all in this direction. In Howrah the increased revenue was also very satisfactory—£140, or 71 per cent. over that of the previous year. The bazaar lighting required continual watchfulness and care; but it was susceptible of very considerable increase, which the Directors hoped would soon be attained. The addition of 19 miles of new mains brought up the total length of Calcutta to 152 miles; and so well had the new pipes been laid, and so much attention had been paid to remedy all the defects, that the quantity of unaccounted-for gas was 4 per cent. less than it was for 1878-9—namely, 300 million cubic feet against 32 millions; while the loss payable to the Corporation was reduced 161 per cent. The Manager hoped that some further improvement might be made in this direction, but the treacherous nature of the soil in Calcutta forbade the expectation that the leakage could be reduced to the average of home working. The Shareholders would be glad to notice that the Directors had made no compromise for cost with regard to the leakage. The Manager hoped that they had had to pay a small enhanced price, but they would be partly, if not altogether, recouped by the increased price obtained for coke. The sales of tar last year were unfavourably affected by importations, but the competition was so well and boldly met by the Directors in reducing the price of the oil, that the leakage was not increased to repeat the experiment. The fitting of the new plant and machinery had placed the Company's works in a state of perfect efficiency, and they were now in a position, with a few additional retorts, to make gas at the rate of a million cubic feet per day; and this gas was delivered so free from impurities that the Analyst of the Government stated that it was very good in every respect. The only unfortunate item to which he must allude was the exchange. From time to time the Directors had been sanguine of an improvement, but their hopes had not been realized. The loss last year was certainly less in the previous year, the average remittances being at 1s. 9d., or 174 per cent. on the amount received at 1s. 10d., or 181 per cent. in the previous year. This was a difference of very nearly 1d. At present the rates were very low, but it was hoped they would improve as the shipping season came on, and the present was about the time for it. The Shareholders might rest assured that the Directors would use every exertion, as they always did, to keep the rates as low as possible, and to have their remittances timed judiciously. They continued to reduce the debenture debt as opportunity occurred, and it would be seen by the accounts that it was much less than last year. They had not paid off all that fell due during the year, having, at the request of some of their old customers, granted a 41 per cent. discount on the interest, but they had not paid off the interest. He would conclude by remarking that the results of the past year's working were perhaps, for reasons he had mentioned, exceptionally good, and justified an increased dividend; but having regard to the effect of the new contract on the present year's profits, it was considered prudent by the Board to strengthen the reserve-fund, not after the rate of dividend. He was sure the Shareholders would approve of the wisdom of such a course.

Mr. W. WHITE seconded the motion.

Mr. LOVJOY asked whether the reserve-fund produced any interest, as it was a large sum, and it occurred to him that it ought not to be lying dormant. One of the paragraphs in the report he regarded as ambiguous. It stated: "In private lighting there has been the addition of 198 consumers and 3080 burners. The extra consumption of gas by meter is encouraging, but the large increase of lights has not yet yielded to the revenue as might have been expected." He regarded this statement as not very satisfactory.

The CHAIRMAN reminded Mr. Lovjoy that the natives were only intermittent consumers.

Mr. BEATTIE said he had also been struck with the ambiguity of the paragraph referred to. If there was any consumption of gas, whether for one hour or six hours, there ought to be so much additional revenue. As to the leakage, was it not possible to do something to support the pipes at the joints? He understood that the pipes subsided at the junctions, and that much of the leakage was caused in this manner. What Mr. Lovjoy had said as to the reserve-fund was important, but if the fund was in their works he contended that it was really not a reserve-fund at all; and in this case, too, the dividend the Shareholders received was not only on the capital, but also on the reserve of £17,181.

Mr. R. H. JONES thought it matter of congratulation that the Directors should have renewed some of the debentures at 41 per cent. as on account to be very jealous of increasing the capital account. Notwithstanding the renewal of certain of the debentures, the capital account had increased by something like £5000; but if the Shareholders looked at what this additional sum had produced, it was certainly satisfactory, because if they turned to the accounts to the 30th of June, 1879, they would find that the gas-rental was £15,000, whereas the gas-rental for the year to the 30th of June last was about 16 per cent. on the share and debenture capital. If they looked to the profit and loss account they also found the same satisfactory results. Taking the year 1878, the gas-rental was something like 15 per cent. upon the capital, whereas this year it was 16 per cent. upon the capital, and a matter over which the Board had no control; taking the year 1879, the gas-rental came up to 202 per cent. upon the cost; and taking the past year, it was 204 per cent. on the cost. He thought these were all very pleasing features in the report.

The CHAIRMAN said that it was a fact that there was a large reserve-fund, and that it had been added to considerably this year; but the Shareholders must be aware the additional plant was a very large cost; there was also a considerable stock of coal on hand, and just now a quantity of 18-inch pipes was being replaced, at an expense of some hundreds of pounds. He was glad to hear of the working of the capital, and it had prevented them calling for additional capital and paying 9 per cent. on it. By this the Directors had saved 41 per cent. at least. As to the paragraph in the report which had been referred to, it should be remembered that the new contract had only been in operation since the 1st of May, and two months' time had elapsed before the balance was struck. He believed that they would see a very large increase in the gas used by the natives. They did not use the gas directly it was laid on, being very economical; still, now that they had it, they would not doubt use it. As to supporting the pipes at the joints, so as to prevent leakage, the Directors found that when they were laid, and it was not known what had become of them. All

kinds of things had been suggested to overcome the difficulty, but the Manager was well aware of the importance of this matter, and he (the Chairman) thought the Directors might leave him to adopt any means that his experience suggested to him to remedy this defect.

Mr. LOVEJOY said he could not concur in the Chairman's remarks as to the reserve-fund. It ought not to be used in support of capital, but be set aside to meet contingencies, not in laying pipes or doing anything substantial at the works.

The CHAIRMAN thought that these were contingencies.

Mr. JONES thought the matter might be met, if, instead of calling it a reserve-fund, they called it undivided profits. Practically this was what it was—not a reserve-fund.

Mr. H. McLAUCHLAN BACKLER said the reserve-fund was an old subject between Mr. Lovejoy and himself. He agreed that the term "reserve-fund" was not perhaps a correct designation of the account as it stood, and probably it should be called "reserve account." It was not actually a fund, but it was fully represented by stocks, which amounted to £22,723, whereas the reserve account amounted to only £17,000 odd. Consequently, it was not actually sunk in the works, but was represented by coal, purifying materials, fittings, pipes, &c., and could be released if the Company chose to raise capital for the purpose. The Directors, however, considered it was far better to employ the reserve in this way than place it in Consols or any other fund which would yield only 3 per cent. As to the unaccounted-for gas, he wished to say that it was not only leakage, but partly condensation, and the condensation of gas was greater in warm climates, such as that of Calcutta, than it would be in this country; so that there was no analogy between the two. The increase in the capital was owing principally to the new contract; and with regard to the paragraph in the report which had been criticized, he thought it would bear strict examination. It meant that all the new consumers, principally natives, added to the Company's rental, but had

not yet become so thoroughly accustomed to the use of the gas as they would be in a short time, and that the Company had not yet realized all the revenue they eventually would from these lights.

Dr. BEATTIE contended that the observations of Mr. Backler were not satisfactory, because if a certain sum were annually taken away from the profits of the Company, placed to an account—no matter what it was called—and utilized as capital, there was then nothing invested. He would not invest the money in Consols, but there were many Colonial securities. He held the Company had nothing reserved to meet contingencies.

Mr. BACKLER, in further reply, said that if the Directors did what Dr. Beattie suggested they would not be in a position to pay the dividend they did on this occasion—they would have so much less to divide, because they would employ so much more share or debenture capital in the concern, instead of employing their own floating reserve account, which would then have to be represented by the interest they would receive upon it.

Mr. H. L. HAMMACK thought that Dr. Beattie's remarks would be perfectly pertinent if the Company had called up all their capital.

The motion was put and carried unanimously.

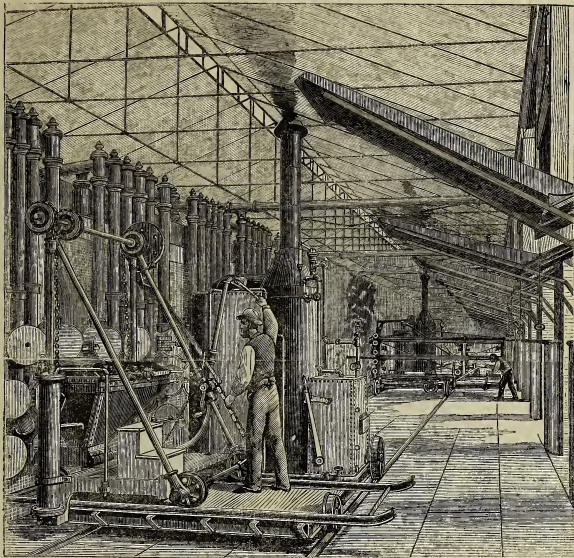
The retiring Directors and Auditors were then severally re-elected, and the dividends recommended in the report were declared. The appropriateness of increasing the remuneration of the Directors was discussed; but, on the motion of Mr. R. H. JONES, it was resolved—"That the remuneration of the Directors be considered at the next meeting of the Shareholders."

On the motion of the CHAIRMAN, seconded by Mr. GARREY, a vote of thanks was passed to the Calcutta Committee, to the Manager (Mr. Blackburn), and to the London staff.

Mr. HERSEY having acknowledged the compliment, a hearty vote of thanks was passed to the Chairman and Directors for their services.

To this the CHAIRMAN briefly responded, and the proceedings closed.

ROSS'S STEAM STOKER.



Among the papers read before the American Gaslight Association, at Chicago, Ill., last month, was one by General Hickenlooper, President of the Cincinnati Gaslight and Coke Company, on "Ross's Steam-Stoking Inventions, and the relation they bear to Gas Interests."

The paper commenced with the lament "that no manufacturing industry, of equal magnitude, inaugurated during the present century, has derived less aid from mechanical appliances than that of the manufacture of gas;" and proceeded to express the author's hope that, in the near future, the power which has "converted the low hum of the spinning-wheel into the music of a thousand spindles, or substituted the lightning-like flash of the locomotive for the lazy labouring of the rumbling coach" might "perform as great wonders for the gas producer." Descending from this "tall talk," General Hickenlooper gave a short account of the various appliances that have been introduced to lighten retort-house labour—from Malben's horizontal rotary retort of 1814 to the most modern apparatus—concerning all of which he thinks there is "little room for surprise that so few should have proved of sufficient practical importance to attract general attention, or warrant words of hearty commendation." As to the "Ross Steam Stokers," the paper says they are "the results of four years of patient and undivided thought, study, and experiment upon the part of a man to whom the wide field of applied mechanics contains few untrodden paths. During this period many different machines were by him devised, built, practically tested, and finally abandoned as not fulfilling all the conditions which, in his judgment, were essential to complete success, leaving the ones which he now presents for the consideration of the gas world as the embodiment of all that was good or worth preserving out of

the mass of accumulated information he thus obtained. As the duties assigned are essentially different, so also are the machines, which he has constructed separate and independent, in order that each may be made to perform its own work, in its own way, and upon its own schedule time."

The accompanying engraving is taken from a photograph of the machines as they appear in action at the works of the Cincinnati Gas Company, and the following description is from General Hickenlooper's paper:—

The discharging machine consists of a carriage or rectangular platform 14 feet in length by 8 feet in width, resting upon two longitudinal and five transverse wrought-iron 6-inch I-beams; the former 8 feet in length, two of the latter 13 ft. 8 in., and three 8 ft. 8 in.—all united by angle plates and rivets, forming a light and durable frame, carried upon four 24-inch flanged wheels, 4-inch face, and keyed to 2½ inch axles 9 ft. 2½ in. long, with bearing journals 2 in. by 6 in., moving upon an 8-foot gauge permanent trackway laid upon the retort-house floor, parallel to the face of the benches. Upon one side of this platform are located the boiler, with independent feeder, pop safety-valve, steam-gauge, &c., water-tank, and light direct-reversing propelling engine.

Located transversely across the other side is a rectangular frame, the horizontal braces of which are the guides for the reciprocating traveller. This frame consists of two vertical cast-iron columns bolted to the ends of the transverse platform beams, and having three wrought-iron pipe struts secured by 1-inch tie-rods passing through their centres.

The column nearest the bench is provided with guides for the reception and vertical play of a sliding box, which the operator can raise or lower

21 lbs. of sulphureted hydrogen, which also abstracted 15 lbs. of carbonic acid, leaving 1500 lbs. of coke in the retorts. The quality of the gas itself, and also of the bye-products, was greatly influenced by the heat and other manipulation in the retort, and it had been found possible in separate works—say a small one and a large one—to produce from the same material, the same quantity of gas, and of the bye-products, and to have thus saved 11,000 tons of 7-candle gas. The coal having been resolved into the above constituents, these had to be dealt with. The gas, with a little enclosed air and carbonic acid sometimes, was sent through the gas-meters; the coke, which amounted to about three-fifths of the original weight, was distributed to the gas-works, and the remainder was sold. In his opinion, if the gas companies would break the coke into small pieces, it would be much more applicable to house-fires than at present. The sulphureted hydrogen, which was removed from the crude gas by means of the purifiers, was at one time entirely wasted on account of its being so mixed with water, and was now sold for the coke gas. The coke gas is purified by means of oxide of iron, which retained the sulphur in the free state, and from which it could be burnt. The oxide of iron, when it became completely charged with sulphur, contained from 40 to 60 per cent. of that substance, and was sold to the vitriol maker, who used it for the place of brimstone. The sulphur, which was obtained with lime, was sold to the gas-works, and this lime was extremely detrimental to the vitriol maker, by preventing the sulphur being completely driven off, and this was a subject on which he had, on two different occasions, called the attention of manufacturers. The sulphur in spent oxide was worth about 4d. per ton, and the value of the sulphur was not ascertained by means of analysis and valuation, however, was by the combustion test, and he was sorry to say that since giving up practice no one had worked it so continuously and persistently as he had done himself. He now came to the ammoniacal liquor, of which about 20 gallons of 5° Twaddell was obtained on an average from each ton of coal. This liquor was sold to the ammonia makers, who often worked it at a distance, and paid enormous sums for carriage; but several gas companies now made it themselves into sulphate of ammonia, and so reaped all the possible benefits. There were oftentimes great injustice done to the purchasers of ammoniacal liquor, the makers of which sold it at 100 gallons per ton of coal, and the ammonia makers, who so much per 100 gallons, per degree Twaddell, they knowing well enough they were on the right side; and so, in order to increase their revenue, they crowded all the impurities they could into the liquor. But this was sharp practice, and he was not sure that the gas companies gained by it in the long run. There now remained only the tar to be dealt with. The tar was sent to the distiller, who distilled it into the light and valuable oils from the heavier and almost worthless pitch. The tar was valuable to the distiller on account of the presence of the following substances—viz., crude naphtha, light oil, burning and solvent naphtha, anthracene, grease, oils, and pitch. The constituents of tar were of great value, and he was not sure that the distiller was not often containing a maximum of crude naphtha and a minimum of anthracene, whilst others were just the reverse, and, of course, the value of the tar must vary with the amounts of these constituents. This being the case, he hoped they would see how unjust it was on the part of gas companies to sell the tar at a fixed price, and he was not sure that it was not during the term when they were under contract to supply an manufacturer with their residual products. After going into details with regard to the method adopted in the treatment of tar when it came into the hands of the manufacturer, Mr. Davis, in conclusion, asked what would happen to the vast industry which was connected with the manufacture of gas, if it were to be done away with. And he answered, that he could not say. Simply nothing. There would spring up, near the coal-pit banks, distillers of coal merely—manufacturers who would distill coal at a low temperature in order to produce tar, and they would call the gas a bye-product. They would get all the coal gas, and the liquor present obtained, say 20 gallons of liquor, of 5° Twaddell, per ton of coal, and the rest would be sold at 100 gallons they would get probably 30 or 40 gallons. He could not, he was sorry to say, give any figures in justification of his theory on this point, as it was many years since such a scheme was tried, and then tar was rather a drug in the market. They would, however, know the money which had been made in the preceding years, and he was not sure that they would not regard him as a prophet, because he now told them that immense sums would be made some day solely by the distillation of coal.

THE CHAIRMAN said the immense developments which had taken place during recent years in the utilization of the waste products of gas manufacture must be patent to every one, but with regard to the electric lighting superseding gas, he thought there would always be plenty of scope left for gas. For many purposes to which it was at present applied gas might probably be superseded, but new uses would be found which would make it more and more indispensable. He thought, however, that they might be so many new channels for what were now termed the waste products, that gas itself might eventually become the real by-product.

Mr. HEYS said even if electricity were adopted for illuminating purposes, quite as much gas as at present would be required, and its application would be largely developed for cooking and mechanical purposes.

Mr. DAVIS having replied to the remarks made upon his paper, the proceedings closed with the usual vote of thanks.

THE GAS LIGHTED BUOY ON THE ROSENEATH PATCH.—The gas buoy with which experiments have been made for some time past on the shoals off Kilcreggan shore has proved such a success, that a similar buoy is to be laid down at Garvel Point, in the estuary of the Clyde.

THE PRICE OF GAS IN PARIS.—It may be remembered that early in the present year the French Minister of the Interior nominated, upon the requisition of the Municipal Council of Paris, a Commission to inquire into the subject of the gas supply of the city, with the object of obtaining from the Paris Gas Company some reduction in price. The action of the Municipal Council was well timed, for the subject of the gas supply of the city was the subject of the price of gas, from several of the Syndical Chambers of Commerce, who contended that the improved systems of gas manufacture now in general use, together with the increased value of residuals, enabled companies to supply gas at a lower price than the existing rate. They urged upon the Council to institute an inquiry as to whether any improvements had been adopted by the Paris Gas Company, and if so whether the City would not therefore be justified in asking for some reduction to be made in the price charged for gas. The Commission above referred to was accordingly appointed, and after a few days' deliberation reported to the Council on the ground stated. However, the Council have themselves appointed a Committee on this subject, and they, attended by the Municipal Engineers, will shortly meet the representatives of the Gas Company, with the object of discussing the subject of the proposed reduction. It seems that the Council are not at all indisposed to lower their charges, and that they would reduce the price of gas from 30c. per cubic metre to 20c. per cubic metre, which would be equal to a reduction of about 2s. 3d. per 100 cubic feet; but for this substantial benefit conferred upon the City generally the Company would expect, and justly, some slight return in the form of prolongation of their concession beyond the limit fixed by the treaty of 1870.

NOTES FROM SCOTLAND.

NOTES FROM SCOTLAND:
(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday*

The month of October and a portion of November will live in the recollection of Scotchmen as being with exceptional and peculiar in the history of the country. From one cause or another, but mainly owing to the dryness of the weather, complaints have been heard of scarcity of water in various parts of the country, and the result has been the inevitable result. Happily for Edinburgh, the citizens have had no cause to grumble on the score that their water was not pure, and for such as it is the community have been thankful. The Edinburgh supply has, as the readers of the JOURNAL may be aware, long grown to be a public utility, and the water has been raised to such an agitation which, while it continued, stirred the community to the heart, roused in an unwonted degree the interest of the inhabitants, and occasioned the expenditure of larger sums of money, both on the part of the Corporation and its opponents.

At the Loch, some 40 miles from the city, and over which the halo of poetry has been flung by the "Wizard of the North," and near to which the Ettrick Shepherd dreamed those quaint poetical productions which have enriched the literature of his country, was the source pictures drawn of insects which were said almost to thicken the water of the Loch, turned the minds, if not the stomachs, of our legislators at Westminster, and the city was consequently compelled to turn its attention to one or other of the many spots, within a radius of 40 miles, where water was to be had. The supply of water to the city was essentially necessary, and as the people had been so accustomed to the beautiful crystal-like water from the Crawley springs, they were, perhaps, a little fastidious in selecting a new site. And what has been the result? They have now produced a supply of water which is not only as "dear" as the old supply, but is from a pretty gathering-grounds in the uplands of Peebleshire large volumes of water are collected and conveyed to an immense reservoir at Alnwickhill, just beyond the village of Liberton, and at such a height above the town that the water is passed through a number of filter-beds 6 feet deep, and is then drawn into cooling-tanks. But, despite all the trouble and expense that the process of purification and cooling costs, the water retains its brownish, washed-out porter colour, to such a degree that the authorities have been obliged to seek for a new supply.

In this city, in fact, at a recent meeting of the Edinburgh and District Water Trust, one of the members suggested that one week's supply of Gladhouse water pure and unmixed should be sent into the city as the fairest way of enabling the inhabitants to judge of its quality; whereupon the worthy members of the Trust, who were present, rose in a body, and, as it were, off, I suppose, and there would be no more trouble." In order to make the water as attractive-looking as possible, the authorities mix the peaty supply from Gladhouse and the crystal-like waters of the Pentlands at the Alnwickhill reservoir, and the great deal of money which has been spent in introducing this additional supply to Edinburgh, it is anything but satisfactory that it should be of such an inferior description. While many of the inhabitants would not care exactly to see our civic rulers poisoned, there are others who would not mind seeing the remainder of their existence, as a warning and an example to succeeding Councilors.

The Shareholders of the Dundee Water Company have now received the last coupon to which they are entitled. A good long time ago a payment of 1s. 5d. per share was made to each Shareholder, which required £1140 8s. 4d. A final dividend of 1d. in the pound has been paid, and this may be said to be the last act of the Dundee Water Company. Of course, the supply is now in the hands of the town.

Ten years ago the Police Commissioners of Broughty Ferry, near Dundee, acquired the property of the gas-works from the town, and since then the manufacture and sale of gas have gone on steadily increasing. At the outset of the business the works produced only 10 million cubic feet of gas a year, but after the experience of a decade they are now making 19 millions, or an average increase of 1 million cubic feet every year. This is encouraging. Of course, this large increase in the make of gas has necessitated many extensions and renewals of the works, and the cost has been no small thing. Not very long ago the Commissioners borrowed £6000, a third of which amount has just been expended in further extensions and improvements. Besides enlarging the retort-house, nine new retorts have been put in, an engine has been erected to work an exhauster, and to pump tar direct from the works to the distillery, and a new boiler has been put in. The works are now employed to take the tar to the distillery, so that in the item of cartage alone the Commissioners are bound to experience a considerable saving when the next balance-sheet comes to be made up. In addition to these improvements the condenser-pipes have been enlarged, and the use of American gasometers has been introduced. The result of these alterations and improvements is already apparent in the quality of the gas supplied, which is now of 28-candle power, and sold at 4s. 2d. per 1000 cubic feet. The works are under the management of Mr. Myers, whose son, Mr. John Myers, recently received the appointment of Manager of the gas-works at Kingsbridge, in South Devon.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday*

The movement for the adoption of the Burghs Gas Supply (Scotland) Act has met with two checks during the past week. In both cases the frustration of the efforts to adopt the Act has been closely connected with the reconstitution of the municipal bodies in which the "gas question" was playing a prominent part. At the meeting of the Glasgow Corporation on the 10th inst. the Police Commissioners of which body the Corporation is a member, resolved, on the 9th of September last, to adopt and apply the Act to that burgh. When the Commissioners met last Monday to resume consideration of the resolution formerly agreed to the opposition came chiefly from a determined opponent of the Act, Mr. J. G. Stewart. This gentleman was strong on the question of the electric light interfering with the large consumption of gas. He also went into the question of "ways and means," and referred to several towns where the gas supply undertakings had become a financial burden. He said that the gas supplied by gas companies, as applied by corporations and that of gas supplied by gas companies, he stated that the average charge in the former case was 5s. 6d. per 1000 cubic feet, as against 4s. 10d. in the latter. Bailie Forsyth, owing to the facts that he was a Sheriff, declined to give his opinion on the matter under consideration, but after the Town Clerk had said that there was nothing in the Act to prevent speaking or voting on the question, he said that he was highly approved of the object of the meeting, and that he would be beneficial to the burgh. Another member, who had moved the adoption of the Act on

stand-pipes, and after this he had very little trouble. He was now using 8-inch stand-pipes and 7-inch dip-pipes, and they had not been stopped more than perhaps two or three times in two or three years. He credited his freedom from stoppages to using small stand-pipes. He did not think that anything less than 8-inch ones should be used.

Mr. WOOD said he had used large stand-pipes would remedy the difficulty. He commenced running higher heats, getting present results while having an old 14-inch hydraulic main. The stand-pipes started from the mouthpiece at 4 inches, and ended at the hydraulic main at 8 inches. In rebuilding one set of benches, he put in a larger main and 6-inch stand-pipes exposed to the same heat, but had none. He had had, with 6-inch stand-pipes, about the same experience that Mr. Forstall had detailed in his paper; and fully as much trouble with them as with smaller ones. There was no question but that with high heats there would be stopped stand-pipes, and a superintendent or engineer of gas-works who boasted of having stopped stand-pipes could be pretty well assured that he was running low heats.

Mr. HILLER said a few years ago he was in Dumfries, and saw Mr. Malan's process in operation, and although he had such high heats he had no trouble from stopped pipes.

Mr. BOURNEMOUTH said a few days previously he had in his works something which was very unusual with him—a stopped pipe. He told the men to shovel cold coal for a little while on the floor of the mouthpiece, as his idea was that cold coal would cool the ascending vapours. It always had had the effect in his case of clearing the pipes.

Mr. FORSTALL said he had tried this plan, but it was almost invariably successful, of putting the last shovelful of coal in the mouthpiece. But it was a costly remedy, and one that he did not like to adopt. He should prefer something more scientific. He wished to say, before the discussion ended, that he did not intend to let the matter rest. He meant to test it most thoroughly by the method he had calculated to arrive at a correct solution of the problem, and would report the result at the next annual meeting of the Association.

Mr. ALLEN was proceeding to advocate the making of water gas as a cure for the troubles complained of, whereupon

Mr. FORSTALL said, "Doubtless you may be cured of the headache by cutting off his head; and there is no doubt in the world that if we rebuild our works and go to making water gas we shall cure the stoppages of our ascension-pipes. But we are looking for a cheap remedy, and I am afraid the one proposed by Mr. Allen is a little too expensive."

Mr. ALLEN: It is not so simple as that. I can show how gas-works can be run without the trouble complained of—and this is the subject of discussion—I am doing good service.

Mr. CARTWRIGHT: I would like to ask Mr. Allen if he has any stand-pipes at all.

Mr. ALLEN: We have one stand-pipe for 100,000 feet. It is only a 7-inch pipe, and we have no trouble with it whatever.

Mr. CARTWRIGHT: And you do not use any coal except for fuel?

Mr. BURTIS said what they were all trying to get at was this: How to keep the stand-pipes free in manufacturing gas from bituminous coal, and not from anything else; so that they need not have any difficulty but no need of the remedy. He asked Mr. Forstall what difficulty he had at that particular point of time the stoppages in his pipes took place after the retorts were charged—how soon after the charge was put in?

Mr. FORSTALL said it was absolutely impossible to tell, because the stoppages were charged to the men. They would run over from one charge to another. The pitch stoppages sometimes occurred in the middle of the charge, and sometimes at the end. Sometimes the pipes would be stopped at the beginning of the next charge, because the pitch had commenced to form above, and they had to clean the stand-pipes between the charges. The stoppages were charged to the men. They would run over from one charge to another. The pitch stoppages sometimes occurred in the middle of the charge, and sometimes at the end. Sometimes the pipes would be stopped at the beginning of the next charge, because the pitch had commenced to form above, and they had to clean the stand-pipes between the charges.

Mr. BURTIS said he had some experience that he had had of this kind, he had noticed that the stoppages appeared to present themselves shortly after the retorts were charged, but not universally so. They very rarely had stoppages in the bridge or dip pipes; they mostly occurred in stand-pipes, a short distance above the mouthpieces or on the lids of the retorts at the mouth of the stand-pipes. He noticed that the condensation took place in the hydraulic main very rapidly.

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as, he believed, was used by Mr. Forstall, to clean out the accumulated material. They had no trouble, however, so long as they used the regular coal, although they had some trouble when they used another kind of coal, to which he had referred.

Mr. SORRELLVILLE asked Mr. Forstall if he had arrived at the conclusion that the cause of the fault of the gases that came up the pipes

Mr. FORSTALL said it was not the gases, but the vapours. He was satisfied that the gas, after it left the retort, lost its heat very rapidly. The heat was retained by the vapours that formed the tar and pitch. He thought these had a very high heat, and if they could arrest and cool them they would not be the heat which went to form the pitch, and this would entirely prevent the stoppages in every case. What he was looking for was not a partial remedy which would relieve the stand, bridge, and dip pipes when they were stopped, but for something which would entirely and inevitably prevent the stoppage in any part of the apparatus; and from experience and thinking the matter over he did not consider that this could be accomplished unless the particular vapours which did the mischief could be stopped and taken out at a point where they could be easily intercepted. He had no doubt whatever that the cooling of the ascension-pipe, as effected by Mr. Wood, afforded relief by that very action. His Mr. Forstall's difference with Mr. Wood was merely a difference of detail, not a difference of principle. Mr. Wood accomplished in his ascension-pipes what he (Mr. Forstall) wanted to accomplish in the mouthpiece.

Mr. COGSWELL said he had not for years and years had a stoppage of a bridge or dip pipe; but there had been some stoppages at the mouths of the stand-pipes. He had not for years and years had a stoppage of a bridge or dip pipe; but there had been some stoppages at the mouths of the stand-pipes. He had not for years and years had a stoppage of a bridge or dip pipe; but there had been some stoppages at the mouths of the stand-pipes.

The discussion was then brought to a close, and a vote of thanks passed by Mr. Forstall for his very interesting paper.

The *Sheffield Independent* says that the first meeting of the Committee of the Hull Water Consumers Defence Association since the recent decision given by the Master of the Rolls in regard to the supply of water to baths was held on Saturday, the 20th inst., when, after considerable discussion, it was unanimously decided to lodge an appeal. The Solicitor to the Association was accordingly instructed to take the necessary steps; and it is probable that the appeal will come on for consideration at some time early in the coming year. In the event of an adverse decision being again given, the Committee will enter into an inquiry to test the reasonableness of the charge now made by the Company for water supplied to baths.

THE DISPOSAL OF SURPLUS GAS PROFITS AT SALFORD.—At a recent meeting of the Salford Gas Consumers Defence Association, the Committee was asked to be submitted to the Gas Committee in conformity with the provisions of the Salford Improvement Act, 1862, showing the proportion among the three districts of the borough of the clear net profits of the gas department during the year ended the 25th of March last in proportion to the gas-rental of each district. The proportion was as follows:—Salford, £30,000; Pendleton, £15,000; and Broughton, £20,750. The minutes of the Gas Committee stated that a letter had been received from the Barton Local Board, asking that the Committee would reconsider the question of charging a differential rate. The Clerk was instructed to inform the Board that the Committee do not at present contemplate any alteration of the differential rate charged to the out-districts.

THE WATER FAMINE IN THE UNITED STATES ENDED.—In reference to our American correspondent's letter, published in the *JOURNAL* for the 16th inst., he writes that the copious rains during the latter part of October relieved, in a great measure, the anxiety felt on all sides at the continuance of the drought, on whose existence to a greater or less extent during the past Summer and Fall, in various parts of the United States. Further rains during the first part of November have restored to its normal condition the water supply of most of the cities. In Brooklyn, N.Y., on Nov. 5, the consumption of water was 36,266,000 gallons, the amount sent out for the same day last year being only 18,526,970 gallons. Doubtless the scarcity of water this year will lead the authorities to improve their system of water supply, so as to possess not only a greater number of sources from which to draw, but also more storage room.

CHESTERBY GAS CONSUMERS COMPANY, LIMITED.—The eighteenth annual meeting of this Company was held on Thursday, the 18th inst.—Mr. J. Bartholomew in the chair. The Secretary, Mr. J. M. Moir, reported that the Directors report, which stated that the business of the Company was gradually increasing, and now permitted the payment of a dividend of 10 per cent., absorbing £790 of the balance of revenue account—£1408 11s. 4d. The report also announced a reduction in the price of gas, of 3d. per 1000 feet, from the beginning of next year. The Chairman, in moving the adoption of the report and accounts, referred at great length to the working of the Company during the past year, and also to their gradually extending operations. The motion having been agreed to, the retiring Directors (Messrs. B. Smith, H. Lovett, and J. Borsley) and Auditor (Capt. W. Dyer) were re-elected, and the title of the Chairman said to the Officers of the Company, on whose united efforts the Chairman said so much of the success of the undertaking depended, Mr. Moir, in acknowledging the compliment, assured the meeting that the officers, one and all, valued very highly the mark of approval thus bestowed; they were glad that their services were appreciated, and trusted they might not be found wanting in the discharge of their duties to the Chairman and the rest of the Directors terminated the proceedings.

HULL CORPORATION WATER SUPPLY.—At the fortnightly meeting of the Hull Water-Works Committee, held on Friday, the 19th inst., the Engineer (Mr. D. Maxwell) presented a report on the present position of the water undertaking. After referring to the sources of supply and the various characters of the water, he presented a statement, in the form of an abstract of the Treasurer's accounts for the past ten years, showing that the average expenditure under the control of the Engineer was, from 1871 to 1876, £1,932 9s. 2d.; expenditure not under the control of the Engineer, £1,171 6s. 9d.—total, £3,103 15s. 7d.; average income, £2,089 7s. 3d.; leaving a deficiency of £1,014 8s. 4d. The average expenditure for the years 1876 to 1880 was £2,550 5s. 8d.; average income, £2,674 7s. 3d.; showing a surplus of £124 8s. 7d. The expenditure included payments to the borough fund of an average annual sum of £3560 12s. 9d. in the five years 1871 to 1875, and an average of £2959 10s. 9d. in the five years 1876 to 1880. The average income required by the Corporation Act of 1843. With regard to the probable future increase in the consumption of water in Hull, the report stated that, with increased trading facilities, Hull would, by the end of the present century, probably contain a population of a quarter of a million—i.e., would increase at an average rate of about 5000 annually. If so, it would then be requiring at least 50 cent. more water than at present—say 7½ million gallons per day. In view of such an extension, the Engineer was of opinion that a new pumping-engine and other works would probably be required within the next few years.

APPLICATIONS FOR LETTERS PATENT.

4795.—DIERFENH, C. F., Baltimore, U.S.A. "Improvements in gas making apparatus." (Complete specification.) Nov. 19, 1880.
 4817.—LÖWÉ, C., and GILL, J., Manchester, "Improvements in the manufacture of certain derivatives from coal tar products." Nov. 20, 1880.
 4819.—MÜLLER, H. L., and ADKINS, W., Birmingham, "Improvements in or additions to gas-engines." Nov. 20, 1880.
 4854.—BAYDONS, E. A., Berlin, "Improvements in apparatus for automatically igniting and extinguishing gas jets or flames, and for regulating the flow of gas to the burners." A communication. Nov. 23, 1880.

4881.—SIMON, L., and WERTENBRUCH, F., Nottingham, "Improvements in gas motor engines." Nov. 24, 1880.
 4891.—JAMESON, J., Thornliebank, Renfrew, N.B., "Improvements in gas-burners." Nov. 25, 1880.
 4908.—GRANT, H. G., Manchester, "Improvements in the manufacture of ammoniacal salts." A communication. Nov. 25, 1880.

PATENT WHICH HAS PASSED THE GREAT SEAL.
 3607.—JENNER, H. W. T., Handsworth, Stafford, "Improvements in gas-engines." Sept. 4, 1880.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Nov. 24, 1880.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.1	16.4	16.9	10.8	8.3	9.6	0.2	0.0	0.1	None.	In excess.
	Camden Town	17.2	16.3	16.7	16.1	13.1	15.2	0.1	0.0	0.0	"	"
	Dalston	17.2	16.6	16.9	15.4	11.0	13.7	0.0	0.0	0.0	"	"
	Bow	17.0	16.2	16.7	12.6	10.3	11.6	0.2	0.0	0.1	"	"
	Chelsea	16.7	16.7	16.7	16.9	13.9	15.5	0.7	0.0	0.4	"	"
	Kingland Road	17.5	16.5	16.9	17.1	11.3	16.1	0.6	0.1	0.3	"	"
South Metropolitan Gas Company . . .	Westminster (cannel gas). . .	21.5	20.6	21.0	21.3	13.8	16.3	0.0	0.0	0.0	"	"
	Peckham	17.2	16.3	16.3	11.2	9.9	10.6	0.4	0.2	0.3	"	"
Commercial Gas Company	Old Ford	17.3	16.9	17.0	16.7	11.0	13.6	0.3	0.2	0.2	"	"
	St. George-in-the-East . . .	17.6	16.2	17.0	10.3	8.0	8.9	0.2	0.0	0.1	"	"

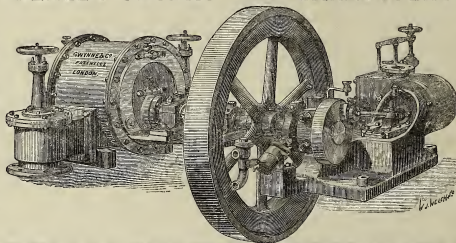
(Signed)

T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 30 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & CO. Have made the largest and most perfect GAS-EXHAUSTER MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is — "Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

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Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

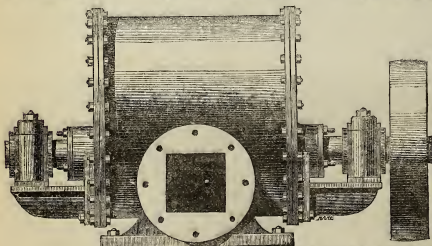
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WROUGHT-IRON SPINDLES AND
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 HYDRAULIC MAIN VALVES,
 BYE-PASS VALVES,
 TAR, LIQUOR, AND OTHER PUMPS,
 SCRUBBERS AND PURIFIERS,
 CONDENSERS, BOILERS, &c.



G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

PHENIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

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TO CORRESPONDENTS.

R. B.—Will write you privately, in the course of the week, on the subject of your letter.

A. COUNTRY MANAGER.—No positive rule can be held to apply in all cases. The relative proportions of the two materials must be determined, in each individual case, by economy, and by due regard to the restrictions under which the manager works. You may soon satisfy yourself by carrying out a series of careful but simple experiments.

ONE WHO WISHES TO USE IR. NEWPORT, MON.—The facts of the case, as reported, are so vague that no benefit, from a scientific point of view, could be derived from their discussion. If, however, you can supply any authentic details and will comply with our rule as to furnishing your name and address (see below), we may be able to refer to the matter.

ONE WHO DOUBTS.—(1) You are not bound to carry a service-pipe beyond 50 yards from an existing main; but up to that point the expense of doing so must be borne by the Company. (2) Yes. (3) The charge must not exceed the lowest price paid by ordinary consumers. (4) The Company.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 7, 1880.

Circular to Gas Companies.

The eventful thirtieth of November has come and gone once more, and we are now able to tell you intend, through the Private Bill Office, to consult the parliamentary oracle during the forthcoming session. Such is the flight of time that the present number of the JOURNAL, which contains the last instalment of our abstracts of the private Acts relating to gas and water passed in the course of the last sessions, also contains the list of applications to be made next year for parliamentary powers in the same departments of British enterprise. It is impossible to prophesy how many and which of the measures now proposed will live through the perils of the session, and be reprinted next autumn with the coveted endorsement notifying that the Act has become part and parcel of the law of the realm. Some, we know, will certainly fall short of this desired consummation, but beyond this we do not wish to penetrate the hidden future. Meanwhile, we may profit-

ably place on record a few facts respecting the notices actually given with particular reference to gas undertakings only.

Twenty-four new Bills, and fifteen Provisional Orders, referring either wholly or in part to gas, are promised for next year, as compared with the total of twenty-nine gas notices deposited last year. There is a large increase in the number of Orders applied for in comparison with the past year, which we presume may be taken to mean an increasing disposition on the part of Companies and Local Authorities to avoid strife, and consequently be enabled to procure, at the cheapest rate, the legislative sanction they need. Seven Companies are desirous of being incorporated by Bill, of which nearly all must look for strong opposition. Two of these (relating to Westbury-upon-Trym) are referred to in another part of the "Circular," and we need only mention the fact that there are two Bills and one Order relating to Woking, Surrey, to indicate that there also the elements of strife exist. We have already referred to the threatened opposition to the Thanet Bill, by a Company promoted by Mr. Davis, and the only other Companies giving notice of incorporation are Alnwick and Hexham, both in Northumberland, and both desiring power to supply the electric light. Eight incorporated companies require additional powers, for which they apply for Acts, none, however, of any note that has not been already noticed in these columns. Four Local Authorities proceed by Bill for the acquisition of gas-works, including the Lincoln Corporation, who have already concluded an agreement with the Gas Company; the Goole hybrid Company, of which mention has frequently been made; the Irvine Burgh, as to which it is not very apparent why the Authority did not elect to proceed under the Scotch Burghs Act; and the Bray Township, who contemplate the purchase of the local section of the undertaking of the Alliance and Dublin Consumers Gas Company. Only two Corporations—Birkenhead and Arbroath—elect to proceed by Bill for further powers with respect to gas. Five Corporations give notice of miscellaneous Bills relating to lighting, in four instances taking the opportunity of inserting provisions for the supply of the electric light.

There is a goodly crop of notices for Orders by the Board of Trade; in only one case, however—that of Woking and Horsell, already mentioned—does a Company seek incorporation by this means. Twelve Companies and gas-works proprietors seek confirmation and extension of powers in this way, and, in the case of Northfleet and Greenhithe, ask for authority to amalgamate. The Corporation of Bolton intend to apply for a Local Government Board Order for power to extend their undertaking, thus solving the difficulty recently alluded to in our columns. The Bridgnorth Local Board are singular in their proposed application to the Local Government Board for power to acquire the gas undertaking of the local Company.

There is nothing very remarkable in these notices, if exception is made of the proposed South Metropolitan Bill, and one or two others noticeable for their unconformity with the usual conditions. It is instructive to note that the Aberdeen Corporation are applying for leave to reduce the illuminating power of their gas, which at present stands highest in the kingdom, at an average of thirty candles, and is sold for 4s. 2d. per thousand cubic feet. The Corporation probably find the "game" is literally "not worth the candle," when the power is kept up to such a point, and they are quite justified in endeavouring to rid themselves of ridiculous requirements in this respect. On the whole, it may be expected that next year the Committee-rooms will be the scenes of not a few lively conflicts, and, perhaps, of more than one fierce struggle for existence.

As stated above, competing notices appeared in the *Gazette* respecting the gas supply of Westbury-upon-Trym, a district on the River Avon, below Bristol. The existing Company desire to be reincorporated with parliamentary powers for the supply of "gas or inflammable air" to so much of the parish of Westbury-upon-Trym as lies in the county of Gloucester, excluding therefrom the Bristol United Gaslight Company, who at present have power over a part of the same district, which, however, they have never exercised. The clause of the notice referring to the powers of the proposed incorporated Company is remarkably extended, including the sale of coal, peat, oil, and sundry other matters connected with the "manufacture of air or inflammable gases." The Company evidently do not intend to be out of court whenever it shall become fashionable to make gas from strange materials, although it may be hoped they will never be called upon to sell "air" to a population suffering from a lack of that essential.

The opposing scheme contemplates the supply of gas to

the parish of Henbury, as well as to part of Westbury. The whole of the Gloucestershire portion of the parish of Westbury-upon-Trym is not to be included in the limits to be defined by this Bill. It will thus be seen the districts of the two Bills under the same heading in the published notices are not strictly the same, but they approximate sufficiently to be in serious conflict. The locality is a fairly promising one for a gas undertaking in an ordinary business sense; but whether it is worth a costly struggle in Parliament is another matter, which must be left for decision to the parties concerned.

Light has furnished much instructive entertainment to London lecture-goers during the past fortnight. Professor Graham Bell's lecture on the phonophone before the Society of Arts on Wednesday was largely attended, and the learned Professor received the honours so justly due to him for his painstaking research. With respect to the instrument which furnished the title of the lecture, not much could be demonstrated, but the chief interest of Professor Bell's discourse was in connection with the illustration of the central principle—the variation in electrical conductivity of selenium in light and darkness—in some of its developments. It has even now become general belief that the phonophone itself, although one of the most striking and original, is perhaps not the most important example of the extent to which the curious physical phenomenon in question is capable of useful application, in the improved form in which it is treated by Professor Bell. Dr. C. W. Siemens came forward on this occasion with an account of his "selenium eye," constructed originally for use as a photometer, but since consigned to the South Kensington Museum as a curiosity. In connection with this particular opening for the utilization of selenium, it does not appear at all rash to expect that a combination of Dr. Siemens's "eye," with an ear adapted to assign definite values to the tones of Professor Bell's resonant instrument, would result in the production of something of the nature of a mechanical photometer.

The other recent sensation is, of course, Mr. J. W. Swan's incandescent lamp, which was shown by the inventor before the Society of Telegraph Engineers last Wednesday week, to a crowded and enthusiastic audience. The beauty of the light was much admired, but, as might be imagined, Mr. A. Siemens and Mr. Crompton, both representing the arc-light interest, viewed the lamp with almost as much jealousy as though they had been gas engineers. The latter division of spectators did not introduce any discordant notes into the general chorus of congratulation addressed to the clever lecturer, but it is not to be supposed they were, on that account, altogether disheartened. The probable cost of the light, including that of the renewal of the carbon wires at intervals, has not yet been given authoritatively, so we really have very little to go upon when attempting to estimate the practical utility of Mr. Swan's invention. After a few more lectures have been given on the incandescent lamp, we may expect to hear of something by way of a Company, with a few millions of share capital, to apply the system to general use. Meanwhile, there is much gnashing of teeth across the Atlantic, among the friends of Mr. T. A. Edison, who have by this time received the full particulars of Mr. Swan's first lecture at Newcastle, and are excusably furious at his presumption in claiming to have anticipated the great American in his most be-puffed invention. We may be sure that much ink will flow in bitter controversy on the important point as to who was first, unless Mr. Swan takes up his position firmly on the facts, and declines to discuss the matter any further. We are not much concerned for the honour of the English or the American inventor, having had sufficient experience of the wisdom of waiting for proofs of the expected success to be furnished by every-day practice, before hastening to ascribe praise to one man or another.

One of the results of freeing the Metropolitan Bridges from toll has been a dispute between the Metropolitan Board of Works and the London Gaslight Company, which culminated in an action between the parties, tried by Justices Field and Manisty in the Queen's Bench Division on Tuesday last. The facts of the case are very simple. The London Gaslight Company had an agreement with the Company of Proprietors of Waterloo Bridge, whereby their gas-mains might be carried over and along the bridge, in consideration of an annual payment of £150 made at the office of the Bridge Company. By the Toll Bridges Act of 1877 it was enacted that the Metropolitan Board should acquire the bridge with a view to its being thrown open, free of toll, for the benefit of the public. The Board consequently paid

£475,000 for the bridge and its approaches, whereupon the use of the roadway was immediately opened for free traffic. The actual structure of the bridge and the thoroughfare over it remained vested in the Board, while the northern and southern approaches were handed over to the care of the authorities of the parishes in which they respectively lay. As soon as the bridge became public property, the Gas Company ceased to pay the annual tribute before mentioned, declining to recognize the Metropolitan Board as the residuary legatees of the Bridge Company, and contending that by the Gas-Works Clauses Act they were entitled to break open any public street or bridge for the purpose of laying pipes therein. The Metropolitan Board asserted their right to receive the money, alleging that the agreement in question was part of the "undertaking" of the Bridge Company for which they had paid the lump sum already referred to, and they accordingly took proceedings to compel payment by the defaulting Gas Company. Judgment was, however, given for the Company by Justice Field, with the full concurrence of Justice Manisty. The learned judges held that there was not any specific or implied provision in the Toll Bridges Act to the effect that the contract should be transferred to the Board. Even if the contract could be held to remain in force with regard to the Gas Company, notwithstanding the demise of the Bridge Company, it did not appear that the Metropolitan Board, merely retaining the roadway over the Bridge itself, could lay claim to a payment that originally also covered the approaches, which had been apportioned to other bodies. Moreover, the Act under which the property became vested in the Board was a public Act, and its provisions must be construed in the public interest and in the sense of a general Act; it was not a private measure intended to settle the claims of two contending contractors. The Counsel for the Board having laid stress upon a section of the Act specially protecting the London Gaslight Company, and having argued that the Company could not escape from all obligations in respect of the rights thus specifically reserved, the judge remarked that as the clause was introduced for the advantage of the Company, they might waive the conditions intended for their own benefit, and then the clause could not apply. The Company were accordingly victorious on every point, and the Metropolitan Board have been taught that they cannot charge toll to one alone of all the users of an enfranchised bridge.

At last there is a promise of cheaper gas at Rochdale. An invoice price of 3s. 11d., reduced for cash to 3s. 9d. and 3s. 6d. per thousand cubic feet to small and large consumers respectively, is certainly unjustifiable for such a locality, and the intended reduction of threepence per thousand feet is nothing remarkable. It ought to have been granted long ago, and in that case there would still have been the opportunity, as at present, of making a reduction to date from the commencement of next year. There is a strong local feeling against the existing rates, and a growing party in the Council has for some considerable time sought to make the practice of the Gas Committee of Rochdale follow the example of those towns where gas consumers are not drawn upon for the relief of ratepayers. To this party, to whose efforts we wish every success, even the present small reduction is consoling, especially as it was resisted by a respectable minority, headed by the Mayor, and the consent of the Council was only obtained as the result of a division in which the party of "indirect taxation" was signally defeated. The debate in the Council meeting of Thursday last upon the minutes of the Gas Committee was remarkable for several examples of direct appeals *ad hominem*, and the two divergent principles of cheap gas and honest rating, and dear gas with relief of rates, found many personal illustrators on both sides. Local parliaments are not bound to be logical, or it would now be impossible for the Rochdale Council to resist an immediate motion to sell gas at cost price. All the arguments of the victorious majority would be as applicable to that proposal as to a temporizing reduction of the selling price, and having approved of the policy of cheap gas when the fundamental issue was clearly before them, we should not be surprised if, after a little time for the completion of their education, this course is admitted in yet another Yorkshire town as the only rational means of distributing local taxation.

The last meeting of the Manchester District Institution of Gas Engineers, under the presidency of Mr. Carr, of Halifax, was held on Saturday, the 27th ult., when Mr. Chew, of Blackpool, was elected President for the ensuing year. For two years in succession the occupants of the chair at those meetings have been popular and thoroughly representative

men, and to this must be ascribed no small portion of the success that has, during this period, attended the work of the Institution. Mr. Chew will have no difficulty in upholding the standard set by his predecessors, and from what he has already shown of his power of keeping abreast of modern progress, his tenure of office should not be marked with any excess of dulness. The late meeting was well attended, and there were several papers read, which will be presented to our readers in the ordinary course. The outgoing President gave a *résumé* of the proceedings of his year of office, marked by his usual breadth of view, and the entire proceedings were fully up to the average of interest.

We commend to the attention of those of our readers who are interested in the development of the lighting power of gas for the purposes of what we must call intense illumination, for want of a better term, to the account of Herr F. Siemens's new regenerative gas-lamps to be found in another column. The principle upon which Herr Siemens has elected to chiefly depend in his efforts to improve the illuminating power of gas by physical means, is far from novel. The fact that hot air increases the brilliancy of flame is quite rudimentary, but doubts have repeatedly been expressed as to whether the possible gain to the power of such a small light as that of an ordinary gas-jet, as might be effected by supplying it with heated air, is sufficient to compensate for the cost and difficulty of the application. So recently as the last meeting of the British Association at Swansea, a report on gas-burners was presented by a Sub-Committee of that body, which attempted to answer the question in the negative. It did not enter into the minds of the reporters that the gas might be made to supply the necessary heat by its own combustion, instead of sending that part of its energy into the atmosphere as a waste, and frequently objectionable, product. It is well known that in some cases it is desirable to adopt more or less expensive devices for the mere purpose of getting rid of the products of the combustion of gas, with no idea of utilizing their heat. It is claimed for Herr Siemens that he has succeeded in combining both these desirable operations in his new lamps, and to such effect that he has left far behind all other forms of gas-burners of which we have any knowledge. Herr Siemens's claims and the testimony of his friends are sure to be sharply examined by those who are eminently qualified to determine their real value, and to this ordeal we must now leave the enthusiastic inventor. The particular lamps referred to may or may not be the great success announced; but, in any case, close research in the same direction must be productive of interesting and valuable results.

THE DESIGNS FOR THE TIPTON LOCAL BOARD NEW GAS-WORKS.—Messrs. Kirkham and Hensley, of 21, Abingdon Street, Westminster, have just been called in to inspect and report upon the plans submitted, in competition, for the new gas-works about to be erected by the Tipton Local Board; and at the last meeting of the Board the report they made in reference to the designs was adopted. On the accompanying sealed envelopes being opened, it was found that the first premium of £100 fell to Mr. Thomas Froude of Birmingham; and the sum of £50 to Messrs. Bromlow and Cheers, of Cornwall Buildings, Queen Victoria Street, E.C.; while the arrangement of Mr. Edward Pincher, of West Bromwich, was adjudged third by Messrs. Kirkham and Hensley.

MR. ALFRED WILLIAMS AND THE MAKERS OF PLAYING CARDS COMPANY.—Mr. Alfred Williams, as Master of the above-named City Guild, presided at the annual dinner last Tuesday, on which occasion many whose names are well known to the gas world were present. Among others Mr. John Aird, Mr. J. Bernays (President of the Society of Engineers), Mr. Baldwin Latham, Mr. Jabez Church, Mr. B. F. Davies, Mr. C. Gandon, Mr. C. Horsley, Mr. Alfred Lass, Mr. W. Liddall, Mr. A. Mead, Mr. M. Mildred, Mr. J. Manwaring, Mr. H. Manwaring, Mr. T. Porter, Mr. R. P. Spike, Mr. W. T. Suger, and Mr. M. Ogilvie Tarbotton. There was a large muster of City magistrates also present; so that the proceedings passed off with great éclat.

THE GAS QUESTION AT STRETFORD.—Last Saturday's *Manchester Guardian* says:—"We understand that, at a special meeting on Thursday, the Shareholders of the Stretford Gas Company had under consideration the recent decision of the Salford Hundred Court of Quarter Sessions with reference to the price of gas and the threatened further proceedings on the part of the Consumers Committee to enforce the return of £17,000, or thereabouts, alleged to have been wrongfully appropriated in the shape of profits. It was also reported that certain negotiations had taken place, with a view to a settlement of the consumers' claims, between two of the Directors and two gentlemen representing the consumers, who number some 7000. Ultimately it was resolved to grant full powers to the Directors to effect such a settlement with the Consumers Committee as may be possible, with the view to bring the case to an end. It is probable that a settlement will shortly be arrived at."

SALE OF SHARES IN THE SHEFFIELD UNITED GAS COMPANY.—On Tuesday last, 517 "B" shares of 48 lbs. each, in the above-named Company, were offered for sale by auction, at Sheffield, by Mr. Bush. They were sold subject to the payment, on Jan. 1, 1881, of 42 per share, this being the amount of the calls which have been made on these shares. There was a large attendance of bidders, and the competition was spirited. The shares were put up in lots of 50, and the first two (100 shares) were purchased at 77s. 6d. per share premium. Then 100 shares were sold at 80s. premium, and 100 at 81s. premium. Another 100 went at 81s. premium, and 50 at 82s. premium. The odd 67 shares were knocked down at 82s. premium.

Water and Sanitary Notes.

A CONSIDERATION of the particulars given in another column as to the applications to be made to Parliament next session in respect to water supply undertakings will show that, with the exception of the Metropolis, there is scarcely anything of note to come before the Legislature. There are only five notices relating to the incorporation of new Companies, and one of these is for sea water, which is rather outside the subject. There will be the Bill of the South Metropolitan Spring Water Company, which, like the sea water scheme, has appeared before; while of the three other projects, one has reference to the parts about Sutton Bridge (in Lincolnshire), another relates to Beverley, and the third to Dundalk. There is one Bill for the purchase of a Water Company's undertaking—that of the Colne and Marsden Local Board, in Lancashire. Five existing Water Companies intend applying to Parliament for additional powers. Among these there is the East London Company, who require further capital. The Sheffield Water Company solicit an extension of time for the completion of works, as well as power to raise some additional capital. The other Companies are situated at Eastbourne, Fylde, and Matlock. In addition there are eighteen notices of application to the Board of Trade under the Gas and Water Works Facilities Act, 1870. Among the applications for extended powers by municipal authorities, is one from the Cheltenham Corporation, who ask for further time for the compulsory purchase of lands and for the construction of the works authorized by their Act of 1878. The Reading Corporation make application in respect to water-works and the supply of water. At Bingley, compulsory powers are sought for the purchase of certain existing works, as well as entering into agreements for taking water in bulk from neighbouring authorities, and selling water to them. In these days, when so much that is sensational with regard to the water supply is continually being advanced, it is somewhat remarkable that so little is proposed in the shape of new works. A calm consideration of the facts may be supposed to lead to conclusions rather at variance with the exciting exordiums which sometimes agitate the public mind. An increased demand for water is naturally to be expected, seeing the rate at which our towns are increasing in size. This, of itself, will necessitate sundry applications to Parliament as time goes on and circumstances alter, in addition to which the development of scattered communities into small townships will bring about many enterprises on a limited scale. On the whole, we are somewhat surprised that the coming session looks so barren in respect to schemes for extending the water supply.

Lieut.-Col. Bolton having a little bevy of analysts about his ears, begins to find himself rather perplexed. These gentlemen are not always easy to be understood, and at the present moment the difficulty is increased by the fact that they fail to agree in their results. Dr. Bernays finds 23-520 grains of solid matter in a gallon of Kent water, while Dr. Frankland reports 29-624 grains, and Dr. Tidy goes as high as 33-610 grains. But the oddest thing of all is the manner in which Dr. Frankland determines whether the water supplied by the various Metropolitan Water Companies is fit or unfit for dietetic purposes. In his last monthly report, Dr. Frankland states that the water drawn from the Thames was unfit for dietetic use, except in the case of the Chelsea Company; yet he says that the water of the Grand Junction and Southwark Companies was "alone efficiently filtered." Thus the water supplied by the Chelsea Company was not "efficiently filtered," and yet is not condemned as unfit for dietetic use, whereas the water supplied by the Grand Junction and Southwark Companies, which was efficiently filtered, is declared to be unfit for drinking purposes. The case is the more puzzling seeing that the samples of all the Thames waters were taken on the same day. Neither does the difficulty end here, for while Dr. Frankland declares the water of the Grand Junction and Southwark Companies to be efficiently filtered, Professor Wanklyn and Mr. W. J. Cooper state that the water supplied by these Companies contained more organic matter than any other. The proportion is not high, being at the utmost six parts in a million; but the contradictory conclusions are remarkable. While accomplished scientists are thus scrutinizing the water as it flows through the mains, Lieut.-Col. Bolton is exercised concerning the state of affairs at the point of exit. The constant supply affords a remedy, but its application is delayed by untoward obstructions. Allusion is made to the recalcitrant Vestryman, an owner of a large quantity of small property, who has lately figured before a

Police Magistrate, for refusing to alter the fittings of his houses so that they might receive the benefit of a constant supply. This occurred in the district of the Lambeth Company, and it appears that in a report made by the Company's Waste Inspector, the water, in one of the houses referred to in the summons, was found running to waste, and "pouring out" through the butt, which was so rotten that a hole could be "pushed through by the finger." The condition of this particular butt is stated to be the same as that of many others in the Metropolis, and the fact is cited by Lieut.-Col. Bolton as showing "the necessity of these abominable receptacles being totally abolished." This gentleman also observes that "as considerable pressure has been put upon the Water Companies to take the initiative in the introduction of the constant supply, it would be well if the public were to render the Companies every assistance, instead of raising difficulties for them to encounter in changing the system of supply, amongst which difficulties may be counted the obstinacy of many of the landlords and tenants in refusing to perform their part of the work." The constant supply is now being introduced by all the Companies except the Grand Junction.

During the recent Local Government Board inquiry, conducted by Mr. Thornhill Harrison, relative to an application by the Rochdale Corporation for power to borrow £80,000 on the water-works account, for the completion of the Spring Mill reservoir, some extraordinary evidence was given by Mr. T. Hawksley, the Engineer of the works, showing that this reservoir was really founded on an ancient glacier bed. A plan of the puddle trench was submitted to the Inspector, and Mr. Hawksley declared it to be the most marvellous puddle trench ever constructed. The natural strata formed a perfect jumble, comprising "all sorts of things." In one place there was a lump of rock, in another a layer of shale, in another a piece of clay, and everything tossed about in the utmost disorder. To all appearance, before the trench was dug, the place was perfectly sound; but when the work was fairly commenced these extraordinary difficulties began to present themselves. It was this which was said to account for the cost of the work. It was certainly an unlucky spot to hit upon, and the Inspector seems to have been very much struck with the plan that was submitted to him. No opposition was offered to the application, and the inquiry only lasted a few hours. The expenditure on the Rochdale Water-Works up to the close of October was stated to be £522,000. The whole supply of water is to over 100,000 people; but the entire number who might be supplied is stated to be about 115,000 or 120,000. The daily supply per head is now between thirteen and fourteen gallons, but Mr. Hawksley said it would soon be fifteen gallons.

The Treasurer of the Metropolitan Dairymen's Benevolent Institution is highly indignant that anything should be said or written in disparagement of British milk. In an after-dinner speech last week, this gentleman is said to have referred to "articles which have recently appeared in several weekly newspapers as to the sale of alleged impure and dangerous milk." Borrowing inspiration from the "Sage of Chelsea," he was led to suppose that the readers of the aforesaid journals were "mostly fools." Some of these people had been actually frightened into giving up milk altogether, and many more had preferred drinking "that pasty sort of stuff called condensed milk." The indignant Treasurer of the Dairymen's Institution went on to argue that the dairymen understood their business very much better than "the incapable idiots" who wrote on the subject in the journals to which he referred. This strikes us as rather strong language for a milkman's advocate. A licensed victualler inveighing against teetotallers could scarcely be more emphatic. But with regard to this milk question, we would remind the highly-incensed champion of the trade, that the remarks in the weekly as well as the daily press have been founded on statements contained in the last annual report of the Local Government Board, and in the reports of sundry Medical Officers of Health. The Chairman of the meeting at which this extraordinary address was given, more discreetly threw the blame of unwholesomeness on milk imported from abroad. "Foreign cans full of foreign milk" were thus indicated as the source of the disease attributed in London to the milk supply. This is rather a puzzling explanation, for we should hardly have thought that foreign milk was fresh enough for the London market. But the milk supply always was a puzzling question, and the irascible Treasurer would have us leave the matter in the hands of "the intelligent dairymen," who, he assures us, understands "the preparation of the milk provided for public use" far better than the idiotic journalists who differ from

him. We feel the great delicacy of the subject, for it might perhaps be suggested that the water had something to do with the question. According to the Local Government Board, nearly a million gallons of water go into the milk supply of London in the course of a year. As the constant supply is not yet universal, the process is not altogether without danger. Somehow or other it appears that, on the whole, milk is either a very excellent article of diet, or else a very bad one.

WATER LEGISLATION FOR 1880.

(Concluded from p. 846.)

ONLY one Act was passed, during the last session of Parliament, authorizing the construction of entirely new works by a Corporation already in possession of powers for the supply of water:—

The *Liverpool Corporation Water-Works Act* is the much-debated authorization of the scheme, so frequently referred to in these columns, for supplying the city with water from the Rivers Vyrnwy, Marchnant, and Afon Cwmy, in Montgomeryshire. The Corporation are empowered to construct a reservoir by an embankment across the River Vyrnwy, and to connect the same by an aqueduct with the River Marchnant. This reservoir is to be connected by an aqueduct running through six counties, and provided with several relieving tanks, with a terminus in the parish of Prescott, Lancs. The execution of the necessary works is made subject to saving clauses for the protection of a number of interests. The Corporation are empowered to borrow for the purposes of the Act £3,250,000, to be redeemed in sixty years after the Act shall have been in operation for ten years, with respect to money borrowed within such period of ten years; afterwards all money borrowed to be repaid in sixty years from the time of borrowing. The Corporation have to provide compensation water for the Severn Commission, and to pay the costs incurred by various Corporations in opposing the Bill.

We now have to deal with the Acts giving further powers to local bodies in respect to water supply; the following having reference to Acts passed solely with this object:—

The *Cork Improvement Act* authorizes the Corporation of Cork, among other things, to improve their water-works, and to borrow £30,000 in respect of the same, to be repaid within sixty years. The Corporation take powers to make bye-laws for the better control of the water supply and prevention of waste. There is no specific statement of the works for which the additional capital is required.

The *Doncaster Corporation Water-Works Act* empowers the Corporation to construct additional works and acquire land compulsorily for such purpose. The Corporation take power to construct a certain line of water-mains in the parish of Ravenfield, Yorkshire, to be completed in five years. The powers for the compulsory purchase of lands, conferred by the Act, are not to extend beyond three years. The cost of the proposed works is to be defrayed out of moneys to be raised by the Corporation under their Act of 1873, or their Provisional Order of 1879.

The *Edinburgh and District Water-Works Act* mainly applies to the financial powers of the Edinburgh and District Water Trustees. The Trustees are empowered to borrow a further sum of £150,000 for the purposes of their undertaking, and also in the course of any year to borrow from bankers sufficient money to defray current expenses, provided that all such loans are paid off at the end of the year during which they have been received. Certain provisions as to the supply of water are included in the Act.

The *Rathmines and Rathgar Water Act* enables the Rathmines and Rathgar Improvement Commissioners to improve the water supply of their district. The Commissioners are authorized to construct an impounding reservoir on the River Dodder, and several catchwater drains in connection therewith, and to construct service reservoirs and lines of water-mains, and to fit up and maintain such telegraphs as they may require for the purposes of their works; all to be completed within five years from the passing of the Act. The Commissioners are empowered to acquire any lands necessary for the protection of their water-works against nuisances. The Commissioners are compelled to afford compensation water to the millowners and others interested in the Upper Dodder, under a penalty of £100 per day for default. The said millowners are empowered to convene meetings for the purpose of regulating their proceedings by vote in connection with the provisions of the Act, a millowner to have one vote in respect of every foot of water-head belonging to the mill for which he is entitled to vote. Millowners in meeting are to have power to appoint an engineer and clerk, and all

expenses incurred in carrying out the provisions of the Act by the millowners are to be borne proportionately by the occupiers of the mills on the same basis as their votes are determined. The Commissioners take power to borrow £100,000, to be redeemed within sixty years. Water is to be supplied constantly at high pressure, and the Commissioners may contract for its supply in bulk. Provisions are inserted for the protection of several parties, including the Alliance and Dublin Consumers Gas Company, and directions are given for rating railways and gas-pipes.

The *Sligo Borough Improvement (Revival of Powers) Act*, among other things, revives the powers and extends the period limited for the construction of water-works and the supply of water authorized by the Sligo Borough Improvement Act, 1869. The Corporation are empowered to construct an impounding reservoir and lines of water-mains, and also a service reservoir, to be completed within five years, and to borrow £25,000 for the purposes of the water-works. All the powers and privileges conferred on the Corporation by the Act of 1869 are revived by this Act, with a few unimportant modifications. The Corporation are authorized to levy for their water supply a rate not exceeding 2s. in the pound. A clause is inserted providing for the sale by the Corporation of pipes, &c., outside their district, to any Sanitary Authority in whose district the pipes may lie, and who may desire to purchase such property.

The *Wakefield Corporation Water-Works Act* authorizes the Corporation of Wakefield to construct certain reservoirs, to contract their limits of supply, and to make additional regulations for their undertaking. The Act of 1839 is repealed, several districts included in the Act of 1876 are excluded from the present Act, and the works authorized by the Act of 1876 are to be relinquished, in consequence of a better source of supply having been found. Reservoirs, filter-beds, and conduits are to be established for taking water from the Rishworth Moors, to be completed within ten years from the passing of the Act, and the power to acquire land compulsorily is limited by the Act to a period of five years. The Corporation take powers to borrow £300,000 for the purposes of the Act, to be repaid, after the expiration of ten years, within a period of seventy years from the commencement of the sinking-fund at that time. The Corporation may, out of the water revenue, establish a reserve-fund amounting to £15,000. Compensation water is to be provided to certain claimants, and there are inserted in the Act clauses for the protection of various neighbouring Corporations. The Corporation are empowered to supply water and sanitary fittings to users of their water, and also to supply water in bulk.

Now come certain Corporation Improvement Acts which among other things, make provision in respect to water supply. They are the following:—

The *Huddersfield Improvement Act* applies in part to the water undertaking. The limits of supply are extended to include several townships in the West Riding of Yorkshire. The Corporation are authorized to sell, under certain restrictions, to any outside Sanitary Authority, any of their pipes, &c., lying within the district of such authority. The Corporation are also authorized to test water in wells within their district, and close same if the water is found unfit for use or otherwise insufficient; and for this purpose the provision of section 44 of the Water-Works Clauses Act, 1847, is amended in accordance with the compulsory powers of the Corporation. The Corporation take power to borrow £150,000 for water-works purposes, to be repaid within one hundred years; the sinking-fund for the repayment thereof to be commenced ten years after the time of borrowing.

The *King's Lynn Corporation Act* amends certain portions of the Act of 1859 respecting the Corporation Water-Works. The water is to be supplied constantly under pressure. Water is not to be stored in underground pools or tanks, and provisions are inserted for maintaining the purity of the source of supply. The Corporation are empowered to make bye-laws for the regulation of the water supply, and to supply fittings. Directions for the application of the water revenues are included.

The *Lancaster Corporation Act* applies to the finances of the water undertaking. The Corporation are empowered to borrow for water-works purposes £15,000, to be repaid in sixty-five years by the operation of a sinking-fund, set aside from the revenues and accumulated at compound interest. A reserve-fund to the extent of £12,000 is to be formed out of the water revenue.

The *Oldham Improvement Act* extends the limits of water supply throughout the district added to the borough by the Act, and to the district of Royton. The Corporation take

power to construct an embankment across the Medlock, and two settling-pools, as well as additional filter-beds and several lines of main, to be completed within ten years. The Corporation are confirmed in the possession of certain lands and buildings purchased by them. Certain provisions in the Act of 1870 are repealed, and it is enacted that water-rents for domestic purposes shall be at the rate of seven and a half and eight and a half per cent. on the gross annual value of houses within and without the borough respectively. Water may also be supplied in bulk without the borough, and the Corporation are authorized to supply fittings, if required. The sum of £50,000 may be set aside out of the water revenue for the formation of a reserve-fund. The Corporation are empowered to borrow for water purposes the sum of £100,000, and may create debenture stock. Water-works loans are to be extinguished, by a sinking-fund, in seventy years.

The *Stafford Corporation Act* authorizes the Corporation, among other things, to abandon the construction of the works of water supply contemplated by their Act of 1876, a higher and more advantageous site for a reservoir having been obtained. The Corporation are empowered to construct a pumping-station and well on their own land, and a reservoir in connection therewith, the said works to be completed in five years. The limits of supply are extended to include certain localities in Staffordshire. For the water purposes of the Act the Corporation are authorized to borrow £25,000, repayable in sixty years.

The *Wigan Improvement Act* includes provisions for the prevention of waste or misuse of water by issuing regulations as to fittings, &c., and the licensing of fitters and plumbers. The Corporation are also authorized to supply water and sanitary fittings, if required by their customers.

The only Act remaining to be noticed is the following, which does not come into any of the classes into which the other Acts have been grouped:—

The *Lancashire County Justices Act* authorizes the Committee of Visitors of the Lancashire County Lunatic Asylum to construct works and supply water to the Asylum. A reservoir is to be constructed and filled by three lines of pipes from a spring and two streams respectively, and thence a line of main is to supply the Asylum. The works are to be completed in five years. The necessary funds to the extent of £20,000 are to be raised on the security of the county rate. Clauses are inserted for the protection of the Corporation of Manchester as regards the Corporation water supply.

ELECTRIC LIGHTING LEGISLATION IN 1880.

In order to complete our notices of the Private Legislation of the past sessions, as far as it affects the interests with which the JOURNAL is principally concerned, we need to mention that three Corporations (besides the instances already recorded under "Gas Legislation") obtained power to supply electric lighting by the under-named Acts:—

The *Burton-upon-Trent Corporation Act* empowers the Corporation for a period of five years, and for the purpose of experiment, to light by electricity streets and places of public resort, and for such purpose they may borrow £5000 on the security of the district rate. The Corporation remain liable, however, to indictment for nuisance in respect of their proceedings under this section. The usual protective clauses are inserted.

The *Hull (Corporation) Electric Lighting Act* is entirely concerned with lighting by electricity. During a period of ten years from Sept. 1, 1880, the Corporation may light by electricity streets and places of public resort, at cost price only, and they may borrow for this purpose the sum of £50,000 on the security of the district rate, repayable in ten years. Clauses are inserted for the protection of the Postmaster-General and of the three Gas Companies supplying Hull and the neighbourhood.

The *Preston Improvement Act* enables the Corporation to light streets and public places by electricity during a period of five years, and they are empowered to borrow for such purpose £10,000 on the security of the district rates, repayable in ten years. The Corporation remain liable for nuisance, and have to submit to the usual saving clauses.

An offer is now before the public such as is not often made—one entire Adventurers share (estimated value £100,000) in the New River Company, which is advertised for sale by tender before the close of the present year. Dividends, directors fees, and bonuses represent, it is stated, an annual value averaging £3040; while, besides conferring the special privileges of a seat at the Board of the Company, and votes for the counties of Middlesex and Hertford, the holding of so large an interest in the Company carries with it a proportionate participation in the reversion of all the freehold land and houses situated in the vicinity of the Company's works at Clerkenwell.

SIEMENS'S REGENERATIVE GAS-LAMPS.

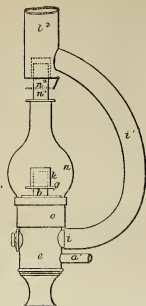


FIG. 1.

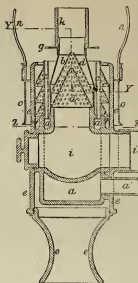


FIG. 2.

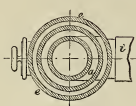


FIG. 3.



FIG. 4.



FIG. 5.

In the beginning of the present year (see Vol. XXXV., p. 60) we gave a translation of a lecture by Herr F. Siemens, of Dresden, on the subject of Regenerative Gas Lighting, in which he described some forms of lamps designed by him to utilize the heat of combustion in increasing the illuminating power of gas. Herr Siemens's operations attracted considerable attention, and opinions have since been freely expressed for and against the principle taken up by him in a new shape, after having been tried without much success in other ways many years since. Herr Siemens at least was sufficiently satisfied with the result of his early experiments to endeavour to improve the construction of his lamps, and the accompanying illustrations, taken from the specification of his English patent, No. 1561 of the present year, will serve to show the latest forms in which he has attempted to carry out the regenerative principle in the combustion of gas for lighting purposes.

The action of the lamps may be briefly described as causing the products of the gas-flame to pass downward through a central regenerative chamber within the annular burner (which now replaces the crude arrangement of separate bat's-wing flames), while the air required for combustion passes upward through an annular chamber surrounding the burner. Fig. 1 is an elevation, and fig. 2 an enlarged vertical section of one form of lamp. Figs. 3 and 4 are transverse sections on the enlarged scale through Z, Z', and Y, Y, respectively. Gas is admitted into the chamber, *a* (fig. 2), by the pipe, *a'*, which may either project from a wall or form part of a pendant, and passes upward to the burner, *c*, consisting of a ring of small tubes. Within the chamber, *a*, is formed a second chamber, *i*, having a lateral opening communicating with the flue tube, *i'*, and an upper opening concentrically within the burner, *c*, and communicating with the lower end of the regenerative chamber, *b*. This chamber contains one or more perforated metallic cones, *d*, and has its upper end contracted somewhat, as shown, and extended a certain height above the top of the burner tubes, *c*. Upon such upper portion is fixed the notched shield or deflector, *g*, and above this is fitted a separate cylinder, *k*, by preference of fire-clay, but which may also be of other suitable heat-resisting material. Surrounding the outside of the gas chamber, *a*, is a casing, *e*, extending up to nearly the tops of the burner tubes, *c*, an annular space intervening between the two, into which are introduced one or more perforated conical frustra, *f*, which constitutes the regenerative chamber for heating the air supply that enters the casing at the open lower end. The upper end of the casing, *e*, is turned over and notched, as shown at *h* (fig. 1), so as to form an outer notched air deflector. The flue tube, *i'*, may lead to any convenient flue or passage for producing the requisite draught; but by preference it is connected, as shown in fig. 1, to a tube, *i'*, immediately above the lamp, the action of which will be presently explained. The upper part of the casing, *e*, is surrounded by a gallery, *o*, carrying a lamp glass, *n*, a metal continuation of which, *n'*, opens into the closed lower end of the tube, *i'*, a slide or throttle-valve being provided at *n'*, whereby this communication may be more or less restricted. When the gas is lighted at the burner, *c*, the lamp first burns in the ordinary manner; that is to say, the air for supporting combustion passes up through the regenerator, *f*, and a draught is created which draws the flame upwards in the chimney-glass. After a few seconds the tube, *i'*, becomes heated, and also heats the tube, *i*, by conduction sufficiently to induce an upward current in the latter, and in consequence of the suction thus caused at the upper end of the

cylinder, *k*, a portion of the heated products of the flame is made to pass downward through the regenerative chamber, *b*, and the chamber *i*, into the flue tubes, *i'* and *i'*. The throttle-valve at *n'* is then closed, whereupon the greater part of the products of combustion is caused to pass downward in the direction already indicated, and impart their heat to the sides and filling of the regenerative chamber, *b*. This heat is radiated and conducted to the chamber, *e*, and the gas tubes, *c*, consequently heating the air and gas passing up through them. The notched deflectors aid the effect by dividing up the air supply into small streams impinging on all sides of the flame, as described in a previous patent. By continuing the air casing, *e*, some distance downward, and making it of heat-conducting material, a draught may be created to enable the chimney-glass to be dispensed with in some cases.

Fig. 5 shows a form of lamp in which the regenerative chamber is made of some height, and constitutes a pedestal for the lamp. In this form the upper end of the chamber may be either open, as in the previous arrangement, and provided with notched shields, or the space outside the burner may be closed at *x*. The filling of the regenerative chamber is in this case formed of perforated cones of fire-clay, *d*, with separate cylindrical pieces, *d'*, to be easily removable in case of breakage. The lower end of the chamber, *b*, communicates by an underground flue with a chimney for producing the necessary draught. In a quiescent atmosphere this lamp burns with a steady flame, and does not need any glass; but for open-air use it is preferably enclosed in a bell-shaped glass, with a large opening at the bottom, as shown.

Concerning the performance of these lamps, Herr Hasse, of the Dresden Gas Works, stated at the last meeting of the German Gas and Water Works Managers Association, that he had tested the standard lamp, fig. 5, with the following results:—At the commencement of the trial, presumably shortly after the lamp had been lighted, an illuminating power of 150 spern candles was obtained with an hourly consumption of 1440 litres of gas. This is equivalent to a photometric value of 2.95 candles per cubic foot, with a consumption of 55.83 cubic feet per hour. The illuminating power gradually increased as the lamp continued burning, until an hour had elapsed, when the heating of the air had reached the highest point, the light then given being equal to 500 candles without increase of the consumption of gas. This is equal to a photometric value of 9.83 candles per cubic foot. Thus it appears, from Herr Hasse's showing, that the regenerative process, when in full operation, increases the illuminating power from 150 to 500 or 3.33 times, rather over half as much as was originally expected by the inventor. Herr Hasse remarks that the long time it takes to arrive at the best conditions of working is a certain disadvantage, though not a serious one. A shorter form of standard lamp is also made by Herr Siemens, at a certain sacrifice of regenerative power, for use on a street pillar, or to stand on a table. The present arrangements of the lamps and their supports are rather cumbersome and inelegant. It remains to be seen whether this can be altered, and as to which Herr Hasse is sanguine.

There is a striking difference in principle between any other modern form of large burners brought out for competition with the electric light, and these lamps of Herr Siemens. All others depend on the construction of the burners and their disposal in groups. Herr Siemens depends not only on the construction of the burner,

but also on the previous heating of the air required for combustion, which he claims to have brought to as great perfection as in the regenerative system of carbonic oxide furnaces. That the burners themselves are of good design, apart from the regenerative process, is said to be proved by Herr Hasse's experiments. Fitted as an ordinary Argand, one of these burners was tested in comparison with an Argand of the best pattern, and gave the following results:—With a consumption of 230 litres (8·12 cubic feet) per hour, the old pattern Argand consuming 200 litres (7·06 cubic feet) per hour, the illuminating power of the two burners was as 175 is to 100; hence, 230 : 200 :: 1·75 : x , or $x = 152$. Therefore, with 230 litres (8·12 cubic feet) of gas per hour, the Siemens burner produces an effect equal to that of 350 litres (12·355 cubic feet) per hour in the Argand. According to this statement it would appear that the consumption of gas in the new burner is as 230 to 350, or as 1 to 1·52, when compared with another giving the same effect; so that the success attending the Siemens system of lighting is in no inconsiderable degree due to the burner itself, although not to the extent to be ascribed to the regenerative principle.

Herr Hasse's statements are satisfactory so far as they go, and we are bound to accept them as strict representations of facts. But they do not go quite to the extent that might be desirable for an inquiry of such vital importance in its bearing on the best conditions under which gas may be consumed for illuminating power. If Herr Siemens is right as to the direction of his researches, nothing short of a revolution in the practice of gas lighting *in excelsis* must be looked for. If Herr Hasse had aspired to be the apostle of the new order of things, he might have added to his declaration several items of information which would have materially helped in establishing his conclusions on an intelligible basis. It was the more incumbent on him to do this as the denial of the utility of pre-heating the air supplied to gas-flames has been placed on record during the present year by the Committee of the British Association for the Advancement of Science, who reported at the Swansea meeting that by heating the air to 320° Fahr. they were only able to obtain an increase of illuminating power from 16 to 17½ candles. Beyond this they did not go, because of the melting of the apparatus employed, and we may suppose that the advantage accruing from the process when carried so far—only 9 per cent. extra illuminating power gained with air at 320° Fahr.—was not sufficient promising to induce them to continue their research with special appliances. The Committee may have been mistaken in this particular, as it is more than probable that an increase of heat in the air, beyond the limit at which they stopped, might have a greatly increased proportionate effect upon the light evolved, for we know that at high temperatures light increases more than heat. But the possibility of conveniently adapting this known effect of heat to any convenient form of burner is just the point that needs conclusive demonstration, and this is not supplied by Herr Hasse. He does not give the temperature to which the air was raised in the lamp tested by him with such surprising results. The facts upon which the Committee in question based their conclusions are given in detail, and we need at least as much detail in the statements which we are required to accept as refuting theirs. We ask, in short, for convincing evidence that a gas-flame may be immensely intensified—say from three to four times—by being supplied with air no hotter than can be carried to it with safety to the material of which the lamp may be conveniently constructed.

Another consideration strikes one in reading Herr Hasse's communication. The illuminating power of the gas experimented with should have been stated as determined by the ordinary standards. There is nothing to show that it was other than the ordinary 14 or 15 candle gas of most Continental towns, but it is not so expressed. Again, the kind of Argand burner used by Herr Hasse in his separate estimation of the Siemens burner needs further definition. There are Argands and Argands, and merely calling the particular sample in question a good one signifies little. These considerations are only mentioned to show how much more conclusive the comparison might have appeared had the factors been stated a little more clearly, without any intention of doubting the value of the information actually given. As a matter of fact, we may find a fair basis for comparison in the statement of the results obtained from the Siemens arrangement when at its best. It there appears that with a consumption of 50·83 cubic feet of gas per hour, a photometric value of 9·83 candles per cubic foot was obtained. According to the experiments of Mr. Hunt, at Birmingham, last spring, a Sugg's 200-candle Argand in a circular lantern, consuming 47·5 cubic feet of gas per hour, gave a value of 3·95 candles per cubic foot. The British Association Committee's experiments with a similar burner, having three concentric rings as well as a centre jet, gave for a consumption of 55 cubic feet of gas per hour a photometric value of 4 candles per cubic foot, the gas employed being of the ordinary 16-candle London quality. It may therefore be assumed that the last-named value—4 candles per cubic foot—is the best result that can be produced in the most powerful Argand burner, with gas of this quality. Assuming, then, that Herr Hasse's experiments were made with gas of equal quality, it follows that the performance of the Siemens burner is to that of the Sugg large Argand as 9·83 to 4, or as 2·457 to 1. Referring to the account of the value of the Siemens burner without regeneration, it is stated that it gave a value of only 2·95 candles per foot under these conditions. This must be considered poor for the large quantity of gas consumed per hour, being little better than the Paris Gas Company's burners, as used in the Rue du Quatre Septembre, and shown by Mr. Hunt to be far inferior to either Sugg's or Bray's burners of anything like equal size. Hence it may be argued, as against Herr Hasse's statement that the Siemens burner, fitted as an ordinary Argand, is so superior

to the "best form" of ordinary Argand, that the Siemens burner must improve wonderfully as it diminishes in size, or the "best form" of Argand with which it was compared must have been in reality a very bad form, since it is, by itself, worse than Sugg's large Argand by 4 to 2·95, or as 1·356 to 1. Judging from this, it would appear that if Siemens's regenerative principle could be applied to a Sugg's 200-candle Argand burner, the recorded effect of the former would be increased by over 35 per cent., or from 9·83 to 13·26 candles per cubic foot.

Considerations of this kind show that there is nothing much to be admired in Herr Siemens's burner, however much may be learnt from the ingenious way in which he makes the heat of gas serve for the advantage of the light. The shortcomings of Herr Hasse's tests need making good by another authority before we can join him in praising the new system unreservedly. Still a case has been made out for further investigation, and it may be hoped that this will at once be carried out. The inventor belongs to a family who have always been ready to publish their work for the benefit of the world, and in the present instance there are special reasons why Herr F. Siemens should be anxious to submit his invention to keen examination by English gas engineers. We are quite willing to admit that he has achieved a success by his last invention, and we now want to know precisely how much he has really effected.

SOUTH METROPOLITAN GAS-WORKS.

Having shown the manner in which the new concrete gasholder-tank at these works has been constructed, we proceed to describe the particularly light framing designed to support the crown of the holder when empty. This timber framing, as fixed in the gasholder-tank, and of which an illustration is given with the present number of the JOURNAL, consists of round poles, the longer ones being 9 to 10 inches in diameter at the butt; and the others 5 to 6 inches in diameter—the latter supporting the radially-arranged framing of 3-inch deals. Square timber uprights were at first thought of, but on consideration the question arose, "Why pay for squaring the timber and weakening it at the same time? Why not use it in its natural form?" To this question there could be but one answer, and round poles were chosen.

The number of uprights has been greatly reduced by the use of side or raking struts, which spring from the main uprights at about the middle of their height. These struts not only take the place of additional uprights, but they stiffen those from which they spring. The main uprights rest on a small pier of concrete, in which two holding-down bolts are fixed, and to these the bases of the three uprights are secured, thus preventing the possibility of floating.

This framing is very much lighter than that fixed in the last gasholder constructed, on which the uprights were more numerous and of greater substance, consisting entirely of "dic square" timber. The radial framing was also much stronger and heavier, being formed with 11 in. by 4 in. timber, whereas in the present case simple deals 9 in. by 3 in. are used, and being cut to the curve of the crown, are reduced at the ends of each deal to 7½ in. by 3 in. There are at four points in the circle a couple of diagonal braces, formed of plain poles, to prevent any lateral motion. At the top of the uprights is a light cast-iron shoe which receives the deals, and to which they are secured.

It was thought when this framing was first laid out on paper, that it would be very light, but now that it is erected it is found to be excessively strong. If it had now to be designed it would be made much lighter, and the radials would not be put so close together. They would be formed of 7 in. by 2½ in. battens, and the number of main uprights would be reduced from 24 sets to 18.

As the benching on which the main uprights rest is not at one uniform level, having been made to follow the line of the fine sand, the small concrete piers also vary in height, in order to make the sets of main uprights uniform in length and position.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

DR. ADAMS'S GAS STOVE.

SIR,—Through a friend, my attention has been directed to the letter of Mr. Deany Lane, of Cork, which appeared in your JOURNAL for Nov. 23. That letter contains several objectionable passages in point of fact, of opinion, and of inference; and I request your permission to correct some of them.

"The report of Dr. Adams and Mr. J. L. Bruce," says Mr. Lane, "states that 51,300 of these new units of heat were utilized per cubic foot of gas." Mr. Lane is under a delusion, for Mr. Bruce and I have never been associated in a joint report; he has never used my units, and he uses exclusively the standard units. His observations on my stove were read to the Philosophical Society of Glasgow, and published, before I had any knowledge of them. In my own communication, made to the same Society a year afterwards, so far from associating Mr. Bruce with these units, I expressly stated that he did not use them, and that he preferred the standard unit, although he admitted all that I claim—viz., their convenience and their very near approach to accuracy.

Mr. Lane says: "Since 1 lb. of air at 63° contains 13·156 cubic feet, and since the specific heat of air is only 0·237 as compared with that of water, it follows that the standard thermal unit contains (13·156 ÷ 0·237) 55·5 of the new units now proposed." Mr. Lane's data are here altogether erroneous. One pound of air contains only 12·14 cubic feet, and the specific heat of air is 0·2370 according to the generally accepted estimate of Regnault, and if the number of decimals is reduced to three the figures ought to be quoted as 0·238. It follows

that (13.14 ÷ 0.28) the standard thermal unit contains 50.5 of the new units now proposed. This correction makes a very material difference when applied to Mr. Lane's calculations.

Mr. Lane also says: "The new stove, which by Dr. Adams's own statement 'gives 8 to 16 times as much useful effect as any stove hitherto made.'" This alleged quotation is a pure fabrication. I never made the statement, and never held the belief it expresses. Mr. Lane says that in certain conditions of the metallic casings of a stove, "the air becomes burnt, as was pointed out by Dr. Arnott half a century ago." Dr. Arnott is not chargeable with such erroneous teachings. Air cannot be burnt, as every chemist knows; and although with uninformed persons there exists such a belief. Dr. Arnott's words are, "The air acquires a burnt and often sulphurous smell, in part, no doubt, because dust, which it often carries, is burned." Mr. Lane guesses the loss of heat in my stove, in the products of combustion passing up the flue, at 20 per cent. Mr. Bruce states, with elaborate precision, the steps by which he demonstrated that this loss was only 7 per cent.; and his conclusion has been frequently verified by other equally competent observers. And there is nothing at all wonderful in this small percentage of lost heat in the chimney. In "Box on Heat," p. 184, it is stated that "nearly the whole of the heat which any fuel is capable of yielding may be utilized by using a long flue-pipe." The interior of my stove is practically a long flue-pipe, folded up, and otherwise of exceptional construction. Mr. Lane shows, by a calculation which includes his erroneous estimate of lost heat, and is based on the erroneous data already corrected, that 1108 of the standard thermal units must be given off by the combustion of 1 cubic foot of gas in order to meet the alleged performance of the stove; that this is a quantity "at variance with all previous experiments;" that "the total heat of combustion of coal gas is generally calculated to be only about 700 units;" and that "unless there is something exceptional in the gas employed in Glasgow" he is "at a loss to account for the extraordinary results, &c." The last paragraph or period contains the substance of Mr. Lane's argument.

The first point is the value of Mr. Lane's standard of 700 units. The lowest estimate I find, with an exception quoted below, is given (by Box) at 696 units; and is vaguely based on experiments by Peclet on the flame of an oil-lamp, and by Morin on the flame of coal gas. These experiments date far back, and are wanting in precision or authoritative value. The next estimate I can find is that of Mr. Vernon Harcourt, who gives the units at 756; calculated from the analysis of a gas of low specific gravity, 430. From the data in Kinnear Clark's "Manual of Tables," &c., I calculate 876 units, and Favre and Silbermann calculate 840 units. These refer to ordinary gas of low specific gravity, say 400 or thereabouts. If canal gas, such as is used in Scotland, were calculated, there would be found higher results; for, as a general rule, the heavier the gas the greater the illuminating power—and there is fair reason to infer that the heating force has a similar analogy. The specific gravity of our Scotch canal gas is given by Mr. G. R. Hisslop, of Paisley, as ranging from 516 to 716. But I cannot anywhere find a quantitative analysis of any of our Scotch gases, and therefore no material for calculating their heating force. Even if I had such analysis, it would still be but a small help in solving the question of the results of the gas to be obtained from right applications of the heating force. Of that more hereafter. Meanwhile, of actual demonstration on this head of the question, the record is a blank, with one partial exception. Dr. Wallace, of this city, in a paper read to the Glasgow Philosophical Society, in December, 1879, said: "As regards heating power, we have no definite information;" and, as an opening contribution to this altogether neglected subject, he gives the results of experiments made by himself on three qualities of gas of specific gravities .574, .525, and .442 respectively. The experiments consisted in raising one gallon of water from 60° to 160° Fahr., and measuring the gas consumed. There were utilized 522, 455, and 347 units of heat; and Dr. Wallace calculated that he had made about 55 per cent. of the theoretical heating power." From this we may calculate that these three samples contained theoretically 940, 827.2, and 630.9 units per cubic foot. So much for the assumed standard of 700 units per cubic foot on which we have so little information, even when limited to theoretical calculations. We are still farther off when we come to the actual results of the application of coal gas for heating purposes. But all available information shows that, by improved methods of utilizing gas, we are making a progress the ultimate extent of which cannot be conjectured from the mere estimate or calculations of theoretical heat units.

Mr. Hood, in his standard work on "Warming and Ventilation," describes a gas stove burning 12 to 15 cubic feet per hour; and, from his data, it is shown that 1 cubic foot of gas will heat 23,513 cubic feet of air 1° Fahr. "This, then," says Mr. Hood, "will be the total effect of a stove of this kind." At a later date Dr. Parkes, in his standard work on "Practical Hygiene," says that 1 cubic foot of gas is capable of warming 31,290 cubic feet of air 1° Fahr., which shows a decided advance in the method employed in utilizing the units of heat, or potential energy stored in the gas. But Mr. Hood, in the latest edition of his work (1879, p. 312), says, "Since the early editions of this work were written, an improved method of burning gas has been introduced," and by this means the expenditure of gas is reduced one-half when the same effect is produced." In other words, he says there is now obtained, by an improved method of burning gas, no less than 47,827.2 cubic feet of air raised 1° Fahr. by 1 cubic foot of gas. And this enormous advance by no means satisfies Mr. Hood's confident anticipations of still greater results from still further improvements. To his remarks on this point, I will afterwards return; but, meanwhile, it will have been noted that we have approached very near the sum of the new units, to the amount of which Mr. Lane so seriously objects. But that sum has been already overpassed. In the latest edition of "Ure's Dictionary of Chemistry," Vol. II, p. 550, it is recorded that 1 cubic foot of gas heated an equivalent containing 2500 cubic feet of air from a temperature of 60° to 80° Fahr. This 2500, multiplied by 20.8, gives 52,000 of the new units, or 700 above the number to which Mr. Lane takes exception.

I have here recorded four stages of progress made in the utilization of gas to the purpose of warming air, and I will present them in tabular

form, which more readily catches the eye and dwells in the memory. I will also, from Mr. Lane's formula corrected, give the equivalent number of standard units of heat utilized per cubic foot of gas.

- First Stage of Progress.*—1 cubic foot of gas heated 23,513.0 cubic feet of air to 1° Fahr. = 471.6 standard units of heat utilized.
Second Stage of Progress.—1 cubic foot of gas heated 31,290.0 cubic feet of air to 1° Fahr. = 619.6 standard units of heat utilized.
Third Stage of Progress.—1 cubic foot of gas heated 47,827.2 cubic feet of air to 1° Fahr. = 948.1 standard units of heat utilized.
Fourth Stage of Progress.—1 cubic foot of gas heated 52,000.0 cubic feet of air to 1° Fahr. = 1029.7 standard units of heat utilized.

The above table is suggestive, and the imagination can picture Mr. Lane at any one of the stages of progress refusing to give credit to any farther advance on the ground of previous experiments, sneering at the authors of the wonderful new discovery, denouncing them as having made statements which were certainly exaggerated, invoking the sympathies of the makers of the older apparatus by suggesting that they were being held up as very much in the dark, &c., &c.

We need not travel far out of the road for abundant illustrations which are strictly in analogy, and which should teach caution to hasty guesses. The weight and the properties of a pound of coal are the same at this day as in the days of William Rumford and Black, who carefully investigated its properties and determined its heating force or units of heat, so far as their knowledge and the appliances at their command enabled them. They came so nearly to a common result that for long it was the accepted rule that 1 lb. of coal would raise the temperature of 39 lbs. of water from 32° to 212° Fahr., and this was the limit. But such was the progress of improvement in apparatus for the combustion of coal, that, in 1838, Mr. Parkes gave, in the "Transactions of the Institution of Civil Engineers," detailed results of the every-day working of a "Cornish engine" which heated 85 lbs. of water per pound of coal from 32° to 212° Fahr.; thus demonstrating an amount of heating force in coal altogether unsuspected, and considerably more than double that of "all previous experiments." But even this extraordinary development of heating force in coal fuel is put in the shade by the statement of Captain Galton, Director of Works and Public Buildings, and a recognized authority on questions of heating. Captain Galton, in a paper read by him to the Society of Arts in 1873, stated that 1 lb. of coal should raise from 50 to 60 gallons (about 600 lbs.) of water from 45° to 212° Fahr.

Illustration might be heaped upon illustration to show the fallacy of confounding the potential energy, or store of power which may be present in a mass of confounding dust with the force or power which this matter is capable of developing under varying conditions, and is made by Mr. Lane when he speaks of "the total heat of combustion of coal gas," as if it were synonymous with what is a mere conventional phrase. If the unit can be effectually utilized, you may then have the total heat—not otherwise. So many grains of gunpowder when ignited within the barrel of the old Brown Bess musket will throw a leaden bullet to little more than 100 yards to any effective purpose, but will project the same bullet with deadly effect to 1500 yards if ignited within the tube of a Whitworth or Martini-Henry rifle. The power or potentiality in the gunpowder remains unchanged, but the projectile force is modified, and the ultimate intended effect is changed, by the co-operating or resisting action of the gun-barrel.

Light and heat are identical forces, and coal gas possesses the elements or power which develop both. But coal gas is not light and is not heat. One sample of coal gas develops more light than another sample, if tested under the same conditions; and the difference between the two, when measured, is called by the gas analyst so many numbers of "candle power." Why not say "units of light"? In strict analogy they are convertible terms; or, if not, I should like to have it pointed out to me wherein consists any essential difference. The candle power—will it be permitted in me to say units of light?—in different manufactures of coal gas varies extremely. What is the reason of this? I say before me wherein the illuminating power or potential unit of light is indicated by the conventional phrase "candle power." I note that 80 range from 11 to 14 candles; 180, from 15 to 20 candles; and 160, from 21 to 33 candles. This range has still farther extremes of candle power, all contained in, and capable of being developed from coal gas—that heterogeneous and most complex composition of different gases and vapours, which, although reducible to classes and leading components, according to the bias or object of each individual analyst, yet comprises and involves a variety of properties and of forces which have not been determined, and certainly cannot be expressed under any term of speech so synonymous with light. Illustrations still more wonderful are likely to be hereafter presented on this subject than I am, and therefore may not require to be reminded that an addition of a few grains of one or more of the constituents of coal gas—say, naphtha or propylene, effects a change of 20 to 60 per cent. in the light-giving effect. This change cannot be ascribed to the presence of carbon alone, although with many that opinion still holds, but to some peculiar association of the gaseous molecules. But although a certain light-giving potentiality may exist in a given sample of gas, that light can only be utilized or developed through the instrumentality of a gas-burner, of which there are many kinds. And how much the choice of a burner may affect the result has been shown by many observers, and probably by no one better than by Dr. Wallace, in the report presented in his own name, and those of Professor Dittmar and Mr. Wills, to the British Association in 1878. Assuming as a thoroughly established fact that whatever the composition of the gas or whatever the source of the illumination, the fact is patent, he says, that a given quantity of gas burned under different conditions yields widely different effects. As gas with which one burner gives a light equal to only 34 candles, gives with a change of burner a light equal to 17½ candles. Another gas gave an illuminating effect ranging from 7 to 36 candles by burning the gas from a series of different burners. Illustrations still more wonderful were also given in Glasgow during the recent Gas Exhibition, and have given an impetus to the extraordinary improvement now visible in our street illuminating apparatus. The smoky yellow "rat-tail" burner, so long the leading, if not the standard burner, has been relegated to the antiquarian repository, where, in the time, Mr. Lane's ideal standard of 700 units will, I have little doubt, be laid aside as one of those "idols of

the mind" which, according to Bacon, have in all times proved the most formidable barriers to intellectual progress.

There are other portions of Mr. Lane's letter on which I would gladly have commented, but for the unavoidable length to which my communication has already extended. In rebutting Mr. Lane's unsupported charges of exaggerated statements, I would willingly have given the names of men, eminent in science, who have independently verified the accuracy of those public statements for which myself or Mr. Bruce can be held responsible. But I am debarred from digging such names into a discussion which Mr. Lane has unnecessarily made personal. I may, however, legitimately refer to men in business, of whose competency and honour there should be no question, and if Mr. Lane applies to either of the gentlemen I name, or to myself, I cannot doubt, and in my own case I will assure him, that he will have fore opportunity to repeat the tests on which the statements, alleged by him to be exaggerated, are based. He may thus still further satisfy himself on the point that he, with perfect fairness of suggestion, but with objectionable tone, has mooted regarding the quality of Glasgow gas. The gentlemen are Mr. W. Harvie, of Glasgow; and Messrs. Wright and Co., of Birmingham. Mr. Harvie, who has made all my models, is well known as having for above 30 years been an industrious practical worker in, and improver of light-giving apparatus; and, having succeeded "beyond all previous experiments" in making ship lights that have been publicly demonstrated as excelling all others in colour, brilliancy, and range, he admittedly holds the foremost position in the supply of our leading mercantile fleets and of the Government vessels of England and other countries. He has been several times invited to Glasgow, sent to London and there tested, and again tested in Glasgow. Messrs. Wright and Co. are at present occupied, with my co-operation, in a series of tests with the double object of a comparison of the heating force of Glasgow gas with that of such low specific gravity as Birmingham gas; and, further, of establishing a ratio between the heating effects of my stoves with that of a given length of hot-water pipe at different temperatures. In communication with any of these gentlemen Mr. Lane will, I feel assured, be instructed and satisfied.

In conclusion, I again refer to that veteran authority Mr. Hood, who is far from being assailed with the experience he has recorded of an improved method of burning gas, although this doubles the total effect beyond what he had indicated as possible in the early editions of his work. He anticipates further improvement, in a passage of his work so pregnant with instruction, and so expressive of the lines on which I have been working and have referred to in the specification of my patent, that I feel assured your readers will be gratified if the passage is reproduced entire:—

"It may be doubted whether the most economical method of burning gas has yet been practised. The burning of 'atmospheric gas' in the Bunsen burner will probably be further improved, if the true principles of combustion be studied. There can be no true economy of gas until the gaseous products attain a temperature of between 800° and 900° Fahr. If this heat, or any considerable portion of it, could be communicated to the atmospheric air before it were mixed with the carburetted hydrogen, there is every reason to suppose greatly increased economy would be the result. The vast economy by the use of the hot blast in the manufacture of iron is a well-known scientific fact; and further that the nearer the temperature of the air can be raised to the point of complete combustion (800° or 900° Fahr.) the greater the economy that results from the operation. There is but little doubt that if the air admitted to the Bunsen burner could be heated to 400° or 500° Fahr. before it entered into combination with the carburetted hydrogen in the Bunsen burner, a greatly increased economy would be the result. It is by no means easy to effect this process of extrinsically heating the air to any considerable extent, as it involves many difficulties of a practical character; but it is probable that considerable improvement in the combustion of gas may be looked for in this direction, if greater economy is to be obtained than that which results from the present Bunsen burner, and the employment of the atmospheric gas."

And this, with literal exactness, one of the effects at which I have aimed, and have successfully attained in my method of burning gas.

62, Cambridge Street, Glasgow, Nov. 27, 1880. JAMES ADAMS, M.D.

[We have received a letter from Mr. Denay Lane in answer to that of Mr. Bruce, published last week; but in view of the possibility of Mr. Lane considering a reply to Dr. Adams's communication necessary, we have held over his letter, at all events till next week. It is right, however, to mention to-day that Mr. Lane says his authority for stating that Mr. Bruce reported conjointly with Dr. Adams on the efficiency of the latter's patented stove, was founded on the following statement put in by John Wright and Co.:—"As a means of comparing the results obtained from this with those of the ordinary stoves, we annex particulars of tests made by Dr. Adams and Mr. J. L. Bruce;" and it was from the particulars so annexed that he quoted the figures given in his letter of the 17th ult.—Ed. J. G. L.]

ECONOMY IN CARBONIZATION.

SIR,—I think something more ought to be said about economy in carbonization. Theoretically the question should be put as follows:—The maximum economy in carbonization is obtained when the greatest value of gas and bye-products—viz., coke, tar, and ammoniacal liquor—are produced, using the smallest quantity of fuel and labour, and wearing out as little as possible of the carbonizing plant.

We call value, quantity multiplied by quality; and I decidedly answer that the greatest value of gas is produced by short-time stoking, light charges, and high heats. Experience tells us that in the same ovens, with the same heats, we can carbonise very nearly the same quantity of coal with six-hour as with four-hour charges, and produce very nearly the same quantity of gas per ton of coal—about 10,400 feet. The quality of the gas only ranges from 14 candles with the six-hour charges, to 16 candles with the four-hour work. To make the same quality of gas in six hours would require either camel or a considerable lowering of the temperature, thus reducing the quantity of coal carbonized to about two-thirds. In my opinion the bye-products are not altered in value by short-time stoking. The coke is made lighter, and a little more friable; but this is compensated for by larger volume. Tar does not seem to be worth less, nor is less made; and the same applies to the ammoniacal liquor. There are, however, fewer naphthalene

deposits, and less sulphur is in the gas. Thus far high heats, short-time stoking, and light charges are economical.

Economy of fuel has been the result each time I have made my oven larger, or raised the heats. But here the matter is somewhat complex. Brisk firing does not necessarily make the retorts hotter, nor does the consumption of more fuel make the fire always brisker. The heat produced must be made useful, and this very much depends on the system of ovens and retort settings in use, and especially on the form of the furnace, its grate and flues. Everything in this quarter is of moment, but this is not the place to discuss the subject. In a general way I assert that large ovens and high heats are economical; and to support this theory may state that I have now ovens of seven retorts (oval ones, the round being the least economical), producing per ton about 62,000 feet of 16-candle gas, at the rate of 10,400 feet per ton of coal, using only common Newcastle coal. The ovens now made do not occupy much more space than the previous ovens, making only 40,000 feet, and they do not require more than one-fourth of the coke made—or less than 19 per cent. in weight of the coal carbonized, when they previously required from 25 to 30 per cent. I do not see that, with regard only to economy of fuel, a much better result has been obtained by the new gas generator systems.

Economy of fuel would undoubtedly be gained to a much greater extent by setting more retorts in the same oven, and I have often asked myself if some enterprising engineer would not some day build ovens of more than the usual seven, eight, or nine retorts. If I were allowed, I would put up an oven of fifteen retorts in four ranges, the lower ones to be worked from the ground level, the upper ones from a movable platform. I should not then be satisfied with a consumption of more than 15 per cent. of the coke produced.

Economy of skokers labour is gained by every improvement or additional facility in the retort-house. Economy of labour is, or will be some day, economy in wages; but economy in wages is a fact as often as the ovens are made to produce a larger quantity of gas, and again high heats and large ovens are the true economists.

The last item in the theory of economy is the durability of the retort settings, &c. High heats are, of course, destructive to them. In my experience, with our present heats the retorts are worn out after about 240 days work, when they previously lasted, or were made to last, about double that time. But then we now make more gas at about the same cost, and by keeping the retorts long in use, the economy is not true economy of coal. Besides, we hope that the retort makers, if required, will make retorts of a quality to meet the new requirements.

Belgium, Dec. 1, 1880.

ECONOMY.

Parliamentary Intelligence.

NOTICES GIVEN FOR PRIVATE BILLS (SESSION 1881)

RELATING TO THE SUPPLY OF GAS, WATER, &c.

AREDSBEN CORPORATION.—Further powers to borrow, and other powers in relation to the Corporation Water-Works; power to substitute one water-rate for the existing water-rate and water-rent; provisions in relation to the limits of water-rates; further powers to borrow, and other powers in relation to the Corporation Gas-Works; reduction of the standard of the quality of gas; power to borrow for current expenditure in connection with the gas department; provisions in relation to sinking-funds; further provisions in relation to the collection of the several rates or assessments leviable by the Corporation; power to levy new rates and assessments; powers to purchase lands by compulsion, and also by agreement; incorporation of Acts; amendment of Acts; and other purposes.

ALNWICK GAS.—Dissolution of the Alnwick Joint-Stock Gas Company; incorporation of new company; purchase of lands by agreement, and to erect and maintain gas-works thereon, and to light the parish of Alnwick; abandonment of existing works when new works are complete; alteration of capital; agreements with the Duke of Northumberland; electric light; and other powers.

BARROW-ON-TRUNTER CORPORATION.—Further powers as to gas and water supply; electric light; borrowing of money and consolidation or adjustment of loans; rates and charges; amendment and incorporation of Acts.

BEVERLEY WATER.—Incorporation of Company; construction of works; supply of water to the borough of Beverley; compulsory purchase of lands; power to levy rates, rents, and charges; and powers affecting the Urban Sanitary Authority of the said borough, and other local authorities.

BINGLEY WATER AND IMPROVEMENT.—Construction of water-works; taking of sums and water; compulsory purchase of existing water-works; water limits, and supply within and beyond; agreements for taking water in bulk from neighbouring authorities, and sale of works to them; compulsory purchase of lands; amendment of lighting powers; borrowing of money; amendment and incorporation of Acts.

BIRMINGHAM CORPORATION GAS AND WATER.—Construction of new water-works and gas-works; extension of limits; acquisition of land; provisions as to electric lighting, &c.; charges; amendment of Acts.

BIRMINGHAM CORPORATION IMPROVEMENT.—Provisions as to water and gas and electric lighting; power as to paving, lighting, sewerage, drainage, and other sanitary conveniences; charges for water and gas and electric lighting; application of profits; power to raise money; amendment and incorporation of Acts.

BRADFORD WATER AND IMPROVEMENT.—Construction and maintenance of reservoirs, conduits, and other new water-works; compensation for sums and water; extension of limits; compulsory purchase of water-works already authorized; raising, levying, borrowing, and re-borrowing further moneys, and repayment thereof; more effectual control of works for distribution and supply of gas and water; amendment, repeal, and incorporation of Acts and Charters.

BRAY TOWNSHIP.—Extension of boundaries, &c., of the Bray township; power to supply water; provisions as to supply of water by the Corporation of Dublin; power to purchase gas undertaking of the Alliance and Dublin Consumers Gas Company, situated in the township, and to supply gas; and other purposes.

BRIGHTON AND HOVE GAS.—Purchase by the Brighton and Hove General Gas Company of the Brighton Gaslight and Coke Company by agreement or amalgamation of those Companies by agreement; purchase by agreement of the Aldrington, Hove, and Brighton Gas Company; compulsory purchase of lands; application of moneys; incorporation and amendment of Acts; and other purposes.

CAMBRIDGE GAS.—Extension of works for manufacture and storage of gas; purchase of additional lands; further money powers; amendment of Acts.

CHELLENHAM CORPORATION WATER.—Extension of time for compulsory purchase of lands and for construction of the works authorized by the Cheltenham Corporation Water Act, 1878; extension of limits of supply; levying of rates; laying out of streets; alteration and extension of existing powers as to powers as to application of borrowed money; new powers as to investment of moneys, and other money powers; amendment of Acts; and other purposes.

CREATOR MOOR LOCAL BOARD.—Construction of new or additional water-works, and provision as to existing works; provision as to compensation; levying of new or additional rates, rents, and charges; borrowing of money and application of funds; additional powers for prevention of waste, &c., of water; as to bye-laws, and generally as to improved water supply; adaptation of existing water-works, and conditions affecting same to new system; repeal, incorporation, and amendment of Acts; and other purposes.

COLNE AND MARSDEN LOCAL BOARD.—Purchase and vesting of Colne Water-Works; new water-works; impounding of streams; supply of water to Local Board district and Trarthen, and also beyond limits; provisions as to compensation water; compulsory purchase of lands; levying rates; borrowing money; incorporation and amendment of Acts.

DUDLEY GAS.—Additional share and loan capital.

DUNDALK WATER.—Incorporation of Company; construction of works; supply of water to the town of Dundalk, &c.; power to take streams; laying out of channels, and provision as to the rights of Drainage and Town Commissioners and trading and other companies; power to the said Commissioners to acquire the undertaking of the Company; amendment of Acts.

EASTBOURNE WATER.—Extension of limits of supply; power to construct water-works; provision as to acquisition of lands; impounding water; rates, supply of water, dwellings for officers and servants, agreements with sanitary authorities and others; additional capital; other powers; amendment or repeal of Acts.

EAST LONDON WATER COMPANY.—Further capital and borrowing powers; amendment of Acts.

EGREMONT LOCAL BOARD.—Construction of water-works and supply of water to Egremont and adjacent places in the county of Cumberland; diversion of roads; compulsory purchase of lands; contracts with sanitary and other authorities; levying of rates; borrowing of money; repeal and amendment of Acts; and other purposes.

FYLDE WATER.—Purchase, compensation, and payment, of compensation water to be delivered into Grizedale Brook; repeal of provisions in Fylde Water-Works Acts as to compensation water; additional capital; incorporation of Acts; repeal and amendment of Acts.

GOOLE GAS AND WATER.—Incorporation of Company; regulation of capital; powers to the Company; power to undertakers of Aire and Calder Navigation and Goole Local Board to subscribe to Company and appoint Directors and proxies to vote on their behalf; sale and transfer of gas undertaking belonging to the Navigation to Company or Local Board; power to Company or Local Board to carry on same; power to undertake the retail portion of gas undertaking of Company or Local Board to perform contracts, &c.; maintenance and extension of gas-works; manufacture and storage and supply of gas, &c., and conversion, sale, and supply of residuals; limits of gas supply; price of gas, &c.; construction of water-works by Company or Local Board; purchase of lands, water, &c., by compulsory agreement; power to take water; limits of water supply; power to supply water by meter, and to provide meters; provisions for the protection of water, &c.; laying of gas and water mains and pipes, and opening of roads, &c.; rates, rents, and charges; application of revenue accruing to Local Board; acquisition of patent rights; power to take water into contract within the limits of authorities, bodies, and persons; power to Local Board to purchase gas and water undertaking of Company; power to undertakers and Local Board to apply funds and borrow money; power to Local Board to apply rates; incorporation and amendment of Acts; and other purposes.

HEXHAM GAS.—Dissolution and re-incorporation of the Hexham Gaslight Company, Limited; power to continue gas-works, to supply gas in Hexham, in the county of Northumberland, and adjoining places; to provide electric light; to raise further capital; to levy rates, rents, and charges; and other purposes.

HENDON GAS.—Acquisition of lands; extension of works; additional capital; manufacture, sale, and supply of engines, stoves, and fittings; pressure, quality, and illuminating power of gas; patent rights; levying of rates, rents, and charges; repeal, amendment, and incorporation of Acts; and for other purposes.

INTYRE BURGH.—Acquisition and transfer of gas-works and water-works; new gas-works and water-works; supply of gas and water; purchase of rights to compensation water; electric and other light; compulsory purchase of lands; agreements with local authorities and others; rates and assessments; power to borrow money; incorporation and amendment of Acts; and other purposes.

KIRKCALDY AND DYSLART WATER.—New works for an additional supply of water from Lothrie Burn; power to take compulsorily and otherwise lands, waters, and streams, and to divert waters and streams; power to supply water to persons, public bodies, and others within or beyond the limits of supply; power to take water into contract within the limits of authorities, bodies, and persons; power to Local Board to purchase gas and water undertaking of Company; power to undertakers and Local Board to apply funds and borrow money; power to Local Board to apply rates; incorporation of Acts; provisions as to sinking-funds; and other purposes.

LINCOLN CORPORATION.—Acquisition of the undertaking of the Lincoln Gaslight and Coke Company, and dissolution of Company; extension of limits of supply for gas, electric and other lighting, heating, and motive power; construction of new water-works; further provision relative to the supply of gas and water; compulsory purchase of land; borrowing powers; amendment of Acts.

LONDON WATER SUPPLY.—Constitution of a public Water Authority, representing the consumers of water in the Metropolis and the adjacent districts, with powers to secure an improved supply of water to such consumers at reasonable rates; power to acquire and utilize existing sources of supply, and to investigate and, if deemed expedient, to obtain powers to provide new sources of supply; transfer to such Water Authority of all powers of regulation and control in respect of the existing water supply now vested in any other body or persons; power to purchase by agreement or arbitration the undertakings of the Metropolitan Water-Works Companies, and to supply water to the Metropolis, and the districts beyond the Metropolis now included within the limits of supply of the Companies whose undertakings are acquired; dissolution of Companies; creation and guarantee of stock; power to raise money for purposes of the Water Authority; amendment of Acts.

LOWER THAMES VALLEY MAIN SEWERAGE BOARD.—Payment of costs incurred by the Board in their application to Parliament for a Bill in 1879; amendment of Acts.

MATLOCK WATER.—New reservoir and works; purchase of lands and easements; compulsory and by agreement; diversion of water; additional capital; alteration of rate of dividend; amendment or repeal of Acts.

OBAN BURGH.—Extension of burgh; new water-works; powers with respect to existing water-works; regulation of water supply; power to levy special water-rate, and other assessments, rates, and rents throughout extended burgh; confirmation of agreements for acquisition of water-works; power to take lands and water; alteration of rights; incorporation, application, and amendment of Acts.

PAISLEY BURGH.—Power to the Paisley Water Commissioners to construct and maintain new water-works; to take lands and water; to borrow further money, and to supply further water within their existing limits, and water to local authorities beyond those limits; power to such authorities to contract therefor; confirmation of agreements; compensation water; prevention of waste; extension of powers of the Paisley Burgh Road Trustees; application of rates levied by them; alteration of rights; incorporation, application, and amendment of Acts.

PARTS OF HOLLAND AND SUTTON BRIDGE WATER.—Incorporation of Company; construction of works; supply of water to Braceborough, Wilsythorpe, Greatford, Baston, Langtoft, Barholm, Stowe, West Deeping, Tallington, Uffington, Market Deeping, Deeping St. James, and Deeping St. Nicholas, in the parts of Kesteven, in the county of Lincoln; and Deeping St. Nicholas, Finchborough, Spalding, Pecklington, Warton, Moulton, Wharfedale, Holbeach, Fleet, Gedney, Sutton St. Nicholas or Lutton, Sutton St. Edmunds, Sutton St. James, and Sutton St. Mary, in the parts of Holland, in the county of Lincoln; compulsory purchase of lands and easements; power to levy rates; agreements with local authorities, bodies, and persons; incorporation and amendment of Acts.

READING CORPORATION.—Provisions as to sewerage and drainage, and as to water-works and the supply of water; rates; amendment of Acts; and other matters.

RICHMOND GAS.—Increase and regulation of capital; voting powers; management of works; purchase of lands; manufacture of gas and residual products; storage of gas and residual products; additional lands; railway siding; testing-plant; repeal and amendment of provisions of the Company's special Act; incorporation of the Gas-Works Clauses Act Amendment Act, 1871, and other Acts.

RIVTON BASIN LOCAL BOARD WATER.—Power to the Local Board to acquire by agreement or compulsory purchase lands, easements, water rights, and other property, and to supply water; and for other purposes.

SALFORD IMPROVEMENT.—Electric lighting; power to Corporation to inspect and regulate the placing of electric and other wires and tubes over streets; extension of borrowing powers; bye-laws; amendment and repeal of Acts.

SEA WATER SUPPLY TO LONDON.—Incorporation of Company; construction of conduits, reservoirs, pumping-station, and other works between Lancing, in Sussex, and London; power to take and supply sea water; compulsory purchase of lands; meters; rates; protection of works, &c., of the Company; power to take water into contract; special provisions as to general Acts; agreements with, and money powers to sanitary and other authorities and bodies; amendment of Acts.

SEVENOAKS GAS.—Extension of gas-works; additional capital; supply of engines, stoves, fittings, &c.; amendment of Acts; and other purposes. **SURREY WATER.**—Extension of time for completion of works; additional capital; amendment of Acts.

SOUTH METROPOLITAN GAS.—Increase of capital; new works; compulsory purchase of lands; extinguishing rights of way; stopping up Ordnance Road; diversion of Marsh Lane; additional lands; supply of gas in bulk; to break up roads, &c.; to purchase, and with other gas companies incorporation and amendment of Acts, &c.

SOUTH METROPOLITAN SPRING WATER.—Incorporation of Company; powers to supply water to the Metropolis south of the Thames, and to certain parishes and places in Surrey, Kent, and Middlesex; construction of works; appointment of directors; power to take water into contract; supply of water by Company; agreements with Surrey and Hampshire Canal Corporation, Limited, the Lambeth, the Southwark and Vauxhall, and the West Surrey Water Companies, and other companies, bodies, and persons, and powers to them to apply and raise moneys; power to take water into contract; power to the Company to purchase or public body established for supplying the Metropolis with water; other powers; amendment or repeal of Acts.

STALYBRIDGE EXTENSION AND IMPROVEMENT.—Lighting powers; electric light; borrowing of money; consolidation of mortgages and rates; special water-rate; incorporation of Acts.

STRAHLING WATER.—Additional reservoir and works, and supply of water; amendment of Acts; and other purposes.

THANET GAS.—Definition and extension of limits of supply; provisions as to supply of gas for special purposes, and as to purchase, sale, use, and hire of engines, stoves, pipes, apparatus, and appliances, and of patents and patent rights; supply of gas in bulk, as well without as within the existing and extended limits; breaking up of streets, roads, &c.; purchase of lands by agreement; increase of capital; incorporation and amendment of Acts; and other purposes.

WESTBURY-UPON-TRYM GAS.—Dissolution and re-incorporation of Westbury-upon-Trym Gaslight Company, Limited; power to erect and maintain works for the manufacture and conversion of gas, &c., and residual products, and to supply gas, &c., within rural part of parish of Westbury-upon-Trym; exclusion of district from that of the Bristol United Gaslight Company; power to purchase lands compulsorily and by agreement; power to break up roads, &c.; to take patent rights, &c.; to deal in coal, coke, &c., and to supply meters and fittings; agreements with public bodies, companies, &c.; rates, rents, and charges; sale or lease of lands; amendment of Acts.

WESTBURY-UPON-TRYM GAS.—Incorporation of Company; construction of gas-works, &c.; purchase of lands, and of manufacture of gas and residual products; power to supply gas to parish of Henbury and part of the parish of Westbury-upon-Trym, in the county of Gloucester, and in bulk beyond those limits; power to hold, &c., patent rights; agreements with sanitary and other authorities, &c.; gas-rates, &c.; power to break up roads, &c.; to take patent rights, &c.; to deal in coal, coke, &c., and to supply meters and fittings; amendment of Acts.

WESTGATE AND BIRCHINGTON GAS.—Incorporation of Company; powers to supply gas to parishes and places of Birchington, Westgate, Acol, St. John the Baptist, and Minster, in the Isle of Thanet; provisions as to acquisition of existing gas-works at Birchington; powers to maintain existing gas-works and construct new works for the manufacture and storage of gas and residual products; powers to manufacture and provide stoves, engines, cooking, heating, and other machinery, and appliances, and to acquire patent rights; agreements with authorities and persons; other powers; amendment or repeal of Acts.

WOKING WATER.—Incorporation of Company; power to supply water to Woking and adjacent places, and to supply water to Mewton, West Clandon, and East Clandon, all in the county of Surrey; to use patent rights, purchase land by compulsion, and erect works; powers as to supply of gas and gas-fittings, engines, stoves, and other appliances for lighting, warming, ventilating, cooking, and other uses; and other capital and borrowing; to lay mains and pipes, &c.; tolls, rates, and duties;

agreements with local and other authorities, &c.; power to future local and other authorities to purchase the whole or any part of the undertaking, and borrow money; incorporation, repeal, and amendment of Acts; and other purposes.

WORKING WATER AND GAS.—Incorporation of Company for supplying water and gas to Woking and adjacent places; construction of works; purchase of lands by compulsion; use of patent rights; tolls, rates, and duties; agreements with public bodies; power to local authorities to purchase the whole or part of the undertaking, and borrow money; incorporation of Acts; and other purposes.

NOTICES OF APPLICATIONS TO THE BOARD OF TRADE (SESSION 1881) UNDER THE GAS AND WATER WORKS FACILITIES ACT, 1870.

ASHFORD (KENT) WATER.—Extension of limits of water supply; increase of capital; and other purposes.

BURNFORD GAS.—Increase of capital; regulation of dividends; boundary of district; new works; manufacture and storage of gas; manufacture and storage of the residual products of the Company and other companies; supply of gas in bulk; gas-fittings and apparatus; additional lands; incorporation of Acts.

CHICHESTER GAS.—Additional capital; amendment or repeal, and incorporation of Acts.

DISERTH, MELDEN, AND PRINSTON WATER.—Power to construct, maintain, and continue water-works, and works connected therewith, in, and to supply water to the township of Uwechlan and the townships, extra-parochial places, or parishes of Cwm, Treacastle, Dysarth (with Ochery-Foel), Rlydai, Meliden, and Prestatyn, in the county of Flint, or some of them; to levy rates; and for other purposes.

ELWES GAS.—Maintenance of existing gas-works; manufacture and storage of gas and residual products; supply of gas-fittings and apparatus; limits of supply; levying of rates and charges; opening of streets; regulation of capital and dividends; additional lands; incorporation of Acts.

GRAY'S THURBOCK GAS.—Power to maintain and continue existing gas-works and construct new works; to supply gas and gas apparatus; to lay down water-works; power to break up streets; to acquire additional land; agreements with local authorities.

HARWICH WATER.—Power to maintain, continue, and enlarge water-works, and to construct additional works, and supply water to the borough of Harwich, and the parishes of St. Nicholas, Dovercourt, and Harlow, in the county of Essex.

HENLEY-ON-THAMES WATER.—Powers to construct water-works and to supply water to and within the several parishes of Henley-on-Thames and Rotherfield Greys, both in the county of Oxford, and of Remenham, in the county of Berks.

HINCHINBROOK GAS.—Extension of limits of supply; enlargement of works; laying mains and pipes, and breaking up streets and roads; levying rates and charges; additional capital; regulations with respect to price and dividends; incorporation of Acts; and other purposes.

LIFORD GAS.—Additional capital and other purposes.

KIRKHAM GAS.—Power to maintain, continue, and enlarge works, and to construct and maintain additional works; to manufacture and storage of gas and residual products in the township of Kirkham, in the county of Lancaster; limits of district of supply; power to acquire and hold lands, break up streets, and to levy rates and charges; incorporation of Acts; and other purposes.

MAIDSTONE WATER.—Construction of new works and taking new springs; taking lands and buildings and other property by agreement; raising additional capital; and other purposes.

NEWHAVEN AND SEAFORD WATER.—Water-works; supply to Newhaven, Seaford, and neighbourhood, in the county of Sussex; levying of water rates.

NEWPORT AND PILLOWENY WATER.—Additional capital.

NORTHFLEET AND GREENHITHE GAS.—Amalgamation of the Northfleet and Greenhithe gas undertakings; repeal of the Greenhithe and Northfleet Provisional Orders; uniform regulations and terms over the united district.

PENNER GAS.—Powers to maintain, &c., existing gas-works; to manufacture, store, and supply gas and residual products; limits of supply; levying of rates and charges; regulation of capital, &c.

PETER WATER.—Increase of capital.

STANLEY AND ZEPHIAH GAS.—Additional capital; additional works; new mains; manufacture and storage of gas and residual products upon additional lands; and other purposes.

STONE GAS.—Power to maintain and continue existing gas-works in the parish of Stone, in the county of Stafford; purchase of lands by agreement; limits of district of supply; power to break up streets and lay rates and charges; agreements with local authorities; additional capital; incorporation of Acts; and other purposes.

WALTHAM ABBEY AND CHEBURY GAS.—Increase of capital; new works; manufacture and storage of gas and residual products; additional lands; gas in bulk; gas-fittings, asphaltum, &c.; incorporation of Gas-Works Clauses Act Amendment Act, 1871, and other Acts; amendment of special Act.

WORKING AND HORSELL GAS.—Construction of gas-works; manufacture and storage of gas and residual products; supply of gas, apparatus, and fittings; levying of rates and charges; opening of streets; regulation of capital; additional lands; incorporation of Acts.

NOTICES OF APPLICATIONS TO THE LOCAL GOVERNMENT BOARD (SESSION 1881) UNDER THE PUBLIC HEALTH ACT, 1875.

BOLTON CORPORATION GAS.—Power to purchase and hold lands; to construct and maintain gas-works; to levy rates and charges; to borrow money; incorporation of Acts.

BRIDGEMOUTH GAS.—Purchase of undertaking of the Bridgmouth Gas Company; maintenance and construction of works for the manufacture of gas and the manufacture of residual products; raising of capital.

LIGHTING OF GARSTANG WITH GAS.—About two years ago a Company was registered with a capital of £2000, in 45 shares, for the purpose of supplying gas and residual products to certain places in Lancashire, among which was Garstang, an ancient market town about 11 miles south of Lancaster. The Company have now completed their works, and in the course of the last week of November the lighting of the town by means of gas was successfully accomplished.

A NATURAL GAS WELL IN CANADA.—The *Scientific American* says that the natural gas well in Madeline County, Quebec, is attracting considerable attention. Recently quite a gathering of prominent Canadians assembled at St. Pierre to witness tests of the illuminating power of the gas, and to hear the report of a chemist who had been commissioned to examine the well. He reported the gas to be proto-carburet of hydrogen, pure and cheaply convertible into illuminating gas. The capacity of the well is considerable—35,000 to 40,000 cubic feet a day.

Legal Intelligence.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

TUESDAY, NOV. 30.

(Before Justices FIELD and MANISTY.)

METROPOLITAN BOARD OF WORKS v. LONDON GASLIGHT COMPANY.

Mr. PHILBRICK, for the defendants, and Mr. BURNETT, for the plaintiffs; the Solicitor-General and Mr. J. C. MATTHEW, for the defendants.

Mr. PHILBRICK said this was an action, brought upon a special case, to recover payment of a certain yearly rent or annual payment of £150 from the London Gaslight Company with respect to the passage of certain trains from those trains, situated on the Surrey side of the river, over Waterloo Bridge to the Middlesex side of London. The obligation originally created was by a deed of licence, dated April 1, 1842, and the question for the Court would be whether the Metropolitan Board of Works, having purchased the undertaking of the Waterloo Bridge Company, had succeeded to the right which that Company had to the payment of this sum. The deed referred to granted to the Board of the Gas Company, for and during the term of 63 years from March 25, 1842, full and free licence, permission, and liberty to lay down pipes and mains for the conveyance and supply of gas over and along Waterloo Bridge and its approaches, for a rental of £150 a year, the payment to be made at the office of the Bridge Company for the time being. The Gas Company laid down two mains over the bridge, and continued to use them up to the month of December, 1870, when they were no longer required, and although they remained under the roadway of the bridge, as by law transmitted to the Metropolitan Board of Works, £150 was duly paid to the Bridge Company up to the half year ending Michaelmas, 1878. In 1877 the Toll Bridges Act was passed, and under its provisions the Metropolitan Board of Works were within two years bound to acquire the bridges mentioned in the Act, and accordingly they acquired the same, and the Metropolitan Board of Works approached the question in the present case would turn upon two sections in the Act of Parliament, the first being the 15th, which stated that "when the receipt for the amount of consideration to be paid for the purchase of the undertaking of any company has been signed in manner directed by this Act, that such undertaking shall, by virtue thereof and of this Act, be deemed to be vested in the Board, and shall be deemed to be the property of the Board, and they shall have absolute control of such undertaking, freed and discharged from all loans, contracts, debts, charges, and liabilities whatsoever of the company effecting the same, and thereupon all duties, obligations, and liabilities of the company in respect of the same shall, by virtue of this Act, be deemed to be transferred to the Board, and shall be deemed to be the property of the Board. With this section must be read the 31st section, which expressly provided that "nothing in this Act shall prejudice, alter, or affect any right, privilege, or power vested in, or enjoyed or exercisable by the London Gaslight Company in respect to its mains." The word "undertaking," as contained in the 15th section, was defined by the Act, and it was held that the bridge of such company, and the approach roads and toll-houses on or near the same, and all lands and works necessarily occupied or used for purposes of the same, and all the estate, right, title, and interest of such company in or to the same, and all rights, powers, authorities, and privileges of such company in relation thereto, under any special Act, or otherwise." Therefore, upon the completion of the purchase, and the signing of the receipt for the £475,000 that was paid for Waterloo Bridge, the Metropolitan Board of Works acquired the "bridge" of the company, the "approach roads," all the "lands and works necessarily occupied," and all the "estate, right, title, and interest of such company in or to the same, and all rights, powers, authorities, and privileges of such company in relation thereto;" the purpose for which the Board acquired the same being that the bridges should be thrown open, for the use of the public, free of toll. The effect of the transfer was provided for in the 16th section, which stated that after the Board had acquired absolutely the bridge, the bridge should be "maintained and repaired" by the Board, so as not to become a county bridge; but the approach roads should be public highways, maintainable and repairable as the other highways of the parish or district in which they were situate. It was therefore quite clear that, under the Act, and under the right which the Board had acquired, to receive this annual payment from the Gas Company were transferred to the Board; and, especially seeing that the rights of the latter Company were expressly preserved by the 31st section of the Act, it would be very strong indeed to say that while, on the one hand, that which should be the subject of compensation was preserved to them, on the other hand, they were to be relieved from the obligation on which their right was dependent. Under these circumstances, he submitted that the obligation was transferred from the Waterloo Bridge Company to the Metropolitan Board of Works.

The Solicitor-General, on behalf of the defendants, said, inasmuch as the obligation arose from the contract or licence between the Waterloo Bridge Company and the defendants, it was for the plaintiffs to show that in some way or other the right to receive this sum of money had passed to them. If it had become vested in the Metropolitan Board of Works, it must have been by virtue of some statute; and the question was whether the Board had acquired the right to receive this sum of money, and the right to receive the money which was payable, under the licence, to the Bridge Company. It would not be contended that, in terms, there was any such vesting; there was no clause which made the Metropolitan Board successors of the Bridge Company. Mr. Philbrick's contention was that sections 15 and 31 of the Toll Bridges Act, 1877, effected the transfer. The actual state of things was this: Supposing that the 31st section had been omitted from the Act, the defendants would have had a right, under the general law, when this bridge and the approaches thereto became a public bridge and public streets, to lay their mains thereon; and, under the Gas-Works Clauses Act, 1847, they would have had a right to break open any public street or bridge for this purpose. So long as Waterloo Bridge was a mere private undertaking, they could only do this by arrangement, but as soon as it became a public street the law gave them a right to lay down their mains. Possibly the 31st section was put in the Act, so that the defendants had not been there the Gas Company would still have had the right, without making any payment at all, therefore, to lay their mains both under the approaches to the bridge, which were now vested in the neighbouring parishes, but which were part of the consideration for the original payment, and also under the bridge itself. The approaches, as he had said, had become public highways, repairable by the parish, and therefore were public highways within the meaning of the Gas-Works Clauses Act, under which, without payment, the Company could lay down their mains. If the defendants wished to open the roads to repair their pipes and mains, the Metropolitan Board could not prevent them, and so the defendants' argument was concerned, and this was a reason why one could understand that the Legislature did not transfer to the Board the right to receive this money, inasmuch as the public Act clearly showed that it was regarded as being for the public good that under all public highways the gas company supplying the same should have the right to lay down their mains, and to repair their mains. Therefore, when the Legislature put an end to this private undertaking, and placed the highway over

Waterloo Bridge and the approaches to the bridge in the same position as on other highway, it was then intended that the Gas Company supplying the district should be entitled to use that highway just in the same manner as any other.

Justice FIELD: But you say that for greater caution they put section 31 into the Act?

THE SOLICITOR-GENERAL: said possibly it was a clause that was in a previous Bill of a different character, which was opposed by the Gas Company, and in which such a clause was inserted, and when the public Bill afterwards came to be framed in the form in which it was, the clause which had been prepared for a different purpose was put in the Bill. By the licence from the Bridge Company to the Gas Company, it was provided that the sum in question was to be paid at the office of the Bridge Company. By the Toll Bridges Act the Bridge Company was dissolved, ceased to exist, and had no office at all, so that the place of payment was destroyed. On these grounds he submitted that the liability could not exist without there being a clear act of location which was transferred to the Metropolitan Board the right to receive payment of the amount formerly met by the Bridge Company.

Justice FIELD said the question asked in this case was whether the plaintiffs, the Metropolitan Board of Works, were entitled to recover from the defendants the yearly rent of £150, and his judgment in favour of the defendants was not entitled. It appeared that the Waterloo Bridge Company had granted to the London Gaslight Company the right to lay down their mains and pipes from one side of the bridge to the other, so that the Gas Company might supply gas on both sides of the river continuously by means of such pipes, the contract giving the Company power to lay their pipes over and under the Waterloo Bridge, and upon, over, and along all or any of the roads belonging to the said Company of Proprietors of Waterloo Bridge, and the Gas Company covenanted, in consideration of this licence, to pay a gross sum of £150 a year to the Waterloo Bridge Company at their office. The £150 was not separately due to each side of the bridge, and so much for the approaches, and the £150 was payable at all it was payable in its entirety, and could not be apportioned between the bridge and the approaches, if there was any distinction between the two. The public having determined to take possession of this private property, the control of the bridge was relegated to the Metropolitan Board of Works, they being the persons to whom the Legislature thought it right to commit the care of important structures like bridges, whilst the approaches were left to the parishes in which they might be situate. The whole spirit of the Toll Bridges Act was in the character of a public Act, not as dealing between two private contractors, but in the sense of a great public benefit to be derived from the bridge being open to the public. After the Act was passed the Gas Company for some time kept their mains on the bridge, but afterwards, when they found they did not require them, removed them. They had paid rent up to a certain day, and then declined to pay any more. It also appeared that the £150 a year which was payable by virtue of the agreement was a matter of course, and the Gas Company was entitled to have compensation. The Act provided that "due regard shall be had to the annual value of the tolls payable and revenue arising in respect of the undertaking," and therefore it might be fairly contended that the Legislature meant to give to the Bridge Company full compensation for the services rendered. When the contract was made it was to be transferred to the Metropolitan Board was another question. If this had been the intent, they might expect to find some such provision in the Act; but there was not a single word specifically referring to such a transfer. If the Legislature had it in their contemplation to transfer this particular contract to the Board of Works, he confessed he could not see how they could have intended that effect. It could not be that they were omitted *per incuriam*, because in sections 17 and 18 the Act did provide for other existing matters of the same sort and kind as the contract. It was, of course, necessary that the contract should be transferred. It having been made with the Waterloo Bridge Company, they alone were able to sue; and therefore, unless it could be shown that, by virtue of the Act of Parliament, the right to sue upon this particular contract had been transferred to the Metropolitan Board of Works, the plaintiffs could not claim, and could not have the judgment of the Court. They were to be understood to satisfy the onus by saying first of all, upon the construction of the 5th section, when the company were to be considered as the purchasers of the undertaking, such undertaking should, by virtue thereof, be transferred to and be vested in the Metropolitan Board. They then said that the "undertaking" included "the bridge of the company and the approaches thereto, the toll-houses on or near the same, and all lands, tenements, and premises necessary or convenient for the purposes of the same, and all the estate, right, title, and interest of such company in or to the same, and all rights, powers, authorities, and privileges of such company in relation thereto, under their special Act and otherwise." He was very much inclined to think that the words were not apt enough to describe this particular contract; but assuming for a moment that the word "undertaking" was intended in this sense, what was to happen? The "undertaking" was to be "transferred to and vested in the Board," and they were to be entitled to possession. The subsequent language of the clause certainly tended to cut down the generality of these words, and to show the meaning in which they were used, because then they were to have the "absolute control of such undertaking freed and discharged from all loans, contracts, debts, charges, and liabilities whatsoever of the company, and all duties, obligations, and liabilities of the company in respect of the same shall, save as by this Act expressly provided, absolutely cease and stand at an end." This clearly was not necessary or intended to be a proviso to cease unless provided for by the Act. Mr. Philbrick admitted that it was so but for the 31st section. That section was clearly introduced for the advantage of the London Gaslight Company, who might waive the conditions introduced for their benefit. They had ceased to occupy, and had ceased, therefore, to have any desire for the condition imposed, and therefore, as it seemed to him, the section did not apply. The policy and language of the Act was very strong against the contention of the plaintiffs, and upon all grounds he was of opinion that they were not entitled to recover.

Justice MAXWELL concurred.

Judgment was therefore entered for the defendants.

BRITON FERRY LOCAL BOARD GAS SUPPLY.—At the meeting of the Briton Ferry Local Board last Thursday—Mr. G. H. Davey in the chair—the Rev. D. Lewis proposed that the price of gas be reduced 1s. per 1000 feet. In support of his motion he stated that the reduction would benefit the consumers directly, for with gas of the present quality at 4s. per 1000 feet they could supply the same quantity of light as they could procure from any vegetable or mineral oil, whilst the ratepayers would benefit indirectly, for as they were themselves the owners of the gas-works, by a larger number of them becoming consumers they would increase the profits, and thus reduce the rates. After some discussion, it was resolved to reduce the price of gas per 1000 feet, thus making the price 4s. 6d., 4s., and 3s. 6d. per 1000 cubic feet. The average illuminating power of the gas is 17-30 candles.

Miscellaneous News.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Forty-fourth Quarterly Meeting of this Institution was held on Saturday, Nov. 27, at the Mitre Hotel, Manchester. Mr. W. CARR (Hallam), the President, occupied the chair, and there was a good attendance of members.

The minutes of the last meeting were, in the absence of the Honorary Secretary (Mr. R. Hunter, of Stalybridge), read by Mr. D. CLARKE (Ashton-under-Lyne), and confirmed.

Mr. Christopher West, Manager of the Ramesboth Gas Company's works, was elected a member of the Institution.

ELECTION OF PRESIDENT.

The next business was the election of President for the year commencing in February, 1881.

The President said they would all remember that at the annual meeting in February last they arranged for a new office in connection with the Institution—that of Vice-President. Prior to that meeting they had not had a Vice-President, and the President for the time being, assisted by the Committee, had to carry on the various matters connected with the Institution. The Committee, however, thought it desirable, on several grounds, to have a Vice-President, one reason being that if the holder of the office proved himself suitable, it would be a nice introduction to the presidency. He believed that the gentleman whom they then appointed Vice-President would make an excellent President, and he had very great pleasure in moving that Mr. Chew, of Blackpool, the Vice-President of the Institution, be elected President for the year commencing in February next. The appointment was made in order that the members of the President-elect might have an opportunity of preparing his address, or of doing anything that he might desire to do in view of the annual meeting over which he would have to preside. He (Mr. Carr) need not say anything as to Mr. Chew's fitness for the office to which he had proposed himself, as the members of the Institution were all well acquainted with him, and some of them knew him better. His conduct as a member of the Institution had been such as to entitle him to their greatest respect and confidence, and—if he was elected, as no doubt he would be—to their warmest support in the position of President.

Mr. Carr (Hallam) said he had great pleasure in seconding the proposal. Mr. Chew had distinguished himself in connection with the electric light and other subjects. They read Mr. Chew's papers and thought about them, and no doubt, his address as President would afford much instruction.

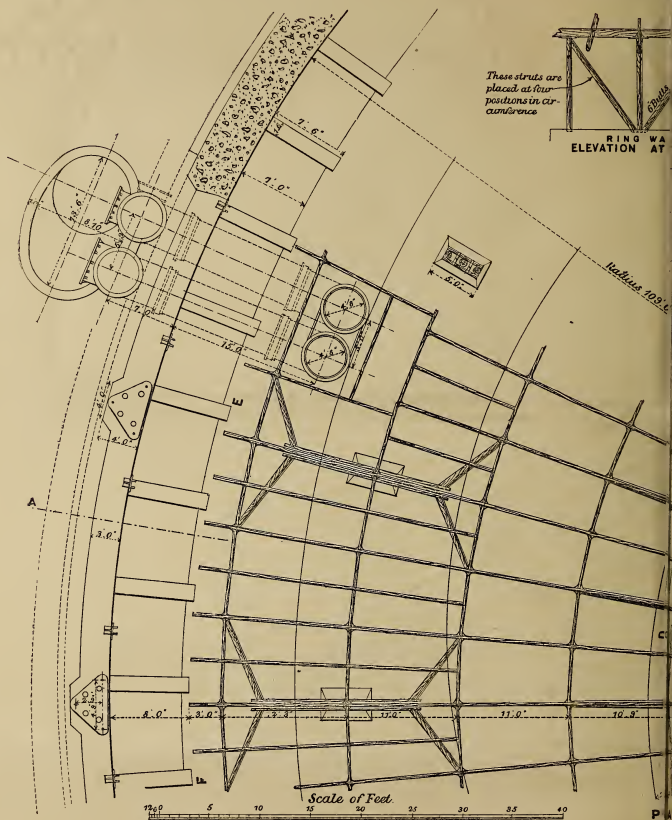
Mr. Woodward (Manchester) said he could not allow the motion to pass without saying a word in support of the candidature of Mr. Chew, who, he believed, would make a very worthy successor to the presidency. He had, perhaps, known Mr. Chew more years than any one present—it was 18 years since he made his acquaintance at his gas-works at Blackpool—and he could say, from his personal knowledge, that Mr. Chew had displayed most ability as a gas engineer and manager in the way in which he had carried out improvements at his works; while they, as members of the Institution knew that he was well able to express himself in clear, nervous English. He had much pleasure in supporting the motion.

The proposition was then put to the meeting, and carried with applause. Mr. Carr could only say that he was extremely gratified that the members of the Institution had conferred upon him, and whatever might be the result of his presidency in the coming year, he trusted he should do his best in promoting the spread of information in connection with gas manufacture; but he could only do this if he had the assistance of all the members of the Institution. He trusted there were gentlemen present who were better fitted for the position than he was, and who would, in due course, grace the office which Mr. Carr at present filled so well.

PRESIDENT'S ADDRESS.

The President (Mr. Carr) said he had not prepared any studied address, but would take the opportunity of making a few remarks, as this was probably the last meeting of the Institution he would be presiding over. He would have the opportunity of introducing his successor at the next meeting, after that should have been left to the members of the Institution. The presidency was concerned to Mr. Chew and those gentlemen to whom he had so gracefully alluded, who were to succeed to the presidency in after years. The office of President was a very honourable one, and one to which he did not succeed without great misgivings; but at the same time, he felt that it should be conferred upon the man who was best qualified to do it. He was not sure that he was the best man for the position, but he felt that the Committee should think him worthy of it, and also that their action should be endorsed by the great body of the members. It was always pleasing to any man to see that what little ability he possessed was recognized by those of his own profession and those who knew something of his capabilities. He said on the occasion of his election that whatever efforts he put forth would be futile if not seconded by the members generally; and he was pleased to think he had had the support of the great body of the members. The meetings of the past year had been well attended, and there had not been any difficulty in getting subject matter for discussions.

He should like to say a word or two, although it might be going over old ground, about the benefit of Institutions such as this. The members were not banded together for trade purposes, and were not likely to do anything which would bring them into discredit; the aims they had at heart were those which were called the public good, the benefit of the community, and to improve them in the sciences—if he might call that a science which was intimately connected with several sciences—or, at any rate, to improve the business with which they were connected. There were several reasons why they should keep themselves together in an Association of this sort. They were scattered all over the country as to be only single individuals, swallowed up in the mass of population whose interests, or, at least, whose direct interests, were not the same as theirs; and it was well for them to meet together in the way they did. They had been passing through a period which had been rather trying to gas managers generally. The late war had had its share in the hearts of owners of property, by the fear that gas lighting was going to be superseded by another form of light. He did not know why there should be the fear which had prevailed, but he supposed that where people's pecuniary interests were concerned some such feeling was natural. So far as he personally was concerned, he would say that if any other light than gas were to be used, it would be a better one, and would be for the community generally; and though they, as gas engineers, might suffer temporarily, he did not know that, so long as they had their hands and their heads, they had anything to fear. Still there had been the difficulty, for people outside understood gas lighting so little, and, as a result, the members of the Institution were often called upon to explain the matter, and it was not difficult to get up a panic. Gas engineers had had this panic to contend with for some few years, but they had been able to meet together, and reassure each other that nothing need be feared so long as they managed their business well. They had been able to do this, and they had time to think of things in this alone, he thought the Associations had done great good. There were some of them who had had greater op-



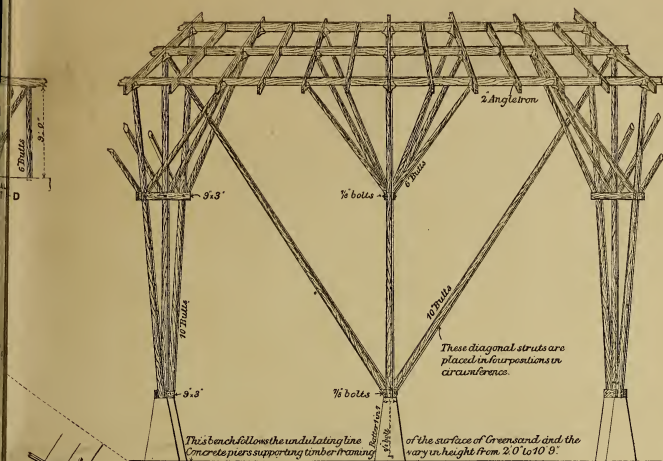
RING WA
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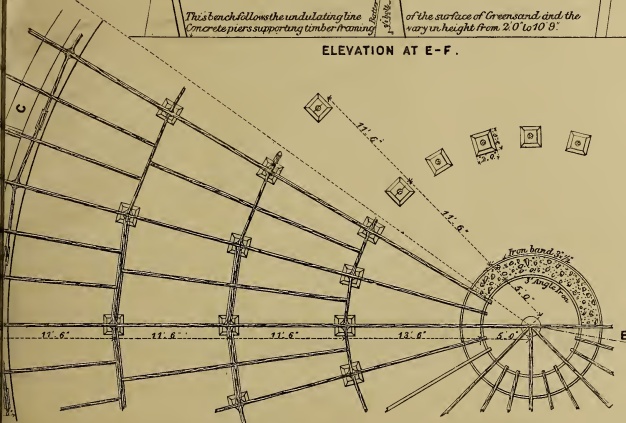
Scale of Feet

FRAMING FOR CROWN OF GASHOLDER—FIXED IN CON

PANY—OLD KENT ROAD WORKS.



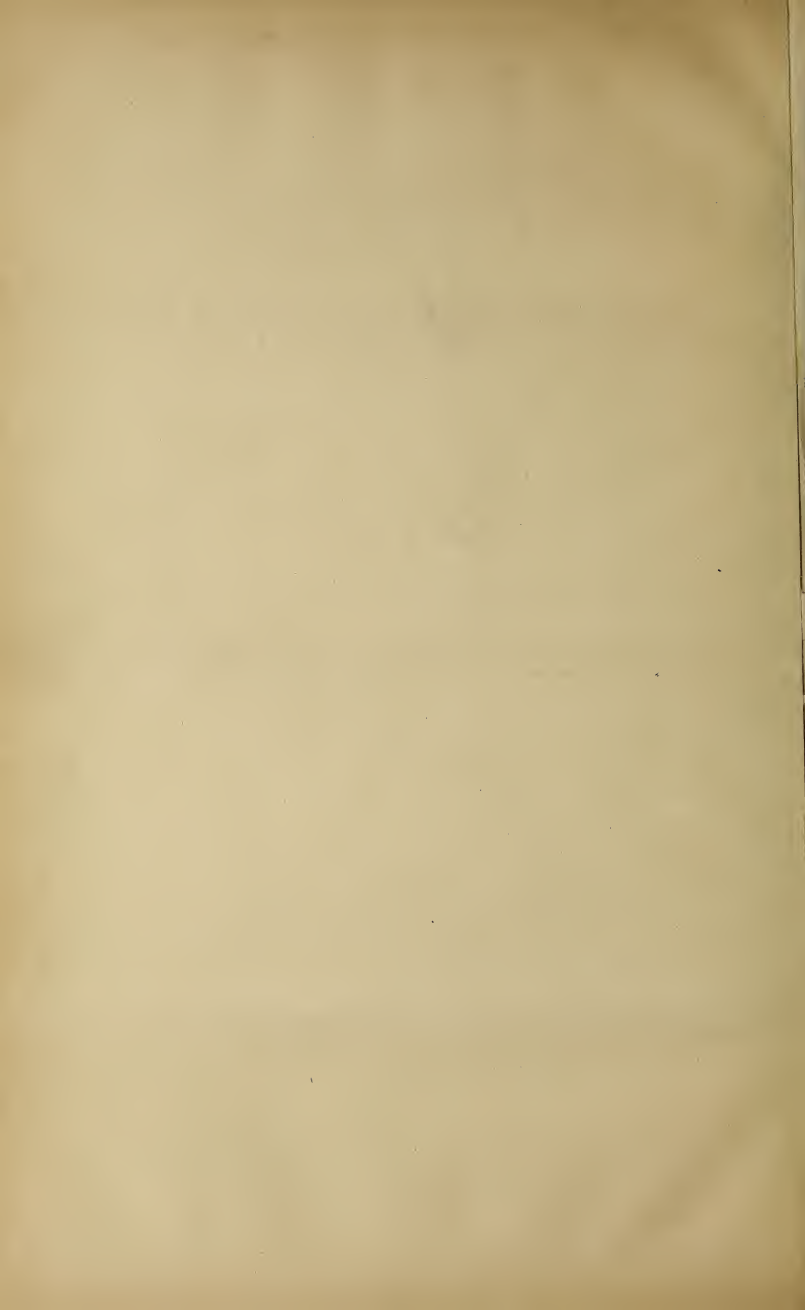
ELEVATION AT E-F.



Note. All top timbers are 9"x3."

GEORGE LIVESEY, M.Inst.C.E., Engineer.

CRETE TANK, 218 FT. DIAMETER BY 55 FT. 6 IN. DEEP.



portunities than others of testing the electric light, and to these they had been able to look for some information as to what was to be done by the light which was to effect such a revolution in the world of lighting. All they had not assessed away. The electric light had been, and he had almost said it had gone; but, at all events, it had almost gone back to that quiet position from which it emerged three years ago. It was not more applicable now to ordinary lighting than it was then, and although they all admitted that there was for the electric light a sphere of usefulness which it would be able to occupy, it did not seem at all likely to enter into general competition with gas.

They were now looking forward to a time of good trade. After the gloom and depression of the past few years, they had reason to hope that the country was entering on an era of good trade, and he thought this was likely to cause them, as gas managers, some little trouble. The demands which would be made upon gas undertakings as trade improved would be very great, and he was not sure that the country was prepared. He did not know whether any of those present had felt the difficulty, but he knew that a difficulty had been experienced in many instances in getting anything like extensions carried out, owing to the fact that the proprietors, or those who had to find the means of carrying out the extensions, were not prepared to do so. He was not sure that the country was prepared to make them, and it might be advantageous for them to come together in these times to see how matters of this sort were being met by others; to help each other out of difficulties, and to prevent anything like calamity ensuing which he believed would shortly come—a great increase in the demand for gas.

In the past nine months the Institution had had three, and in the case which they were then holding, four meetings under his presidency, and at those meetings a number of papers had been read. At the first meeting they had one by Mr. Hawkins, on purification, which brought forth considerable information that was novel to most of the members. He had also read a paper on the use of the gas, and he did not say that he had availed himself of it to any great extent, though he had tried one or two experiments suggested by it. He had, however, heard of some gas managers who had found the information which they gleaned from the paper and the discussion, very valuable to them. They had at the same meeting a paper by Mr. Chew, son of the President, on the use of the gas in the manufacture of soda, and this was pretty well reported, not only in the Manchester papers but in *The Times*, and a short abstract of the proceedings of their meeting on that occasion was published throughout the length and breadth of the country. This, he thought, showed that in meeting together as an Institution, they could do much more than they could do by themselves, and that the public generally took some interest in their proceedings. Following upon that meeting they had the May gathering at Greenfield. They had had such sage advice from their excellent Past-President (Mr. Newburring), from time to time, on the value of tempering with their work a little rational enjoyment and sensible pleasure, that it was hardly possible to do otherwise. He had also, in his opening address, made reference to the special treat which they had in viewing the water-works then in course of construction at Greenfield. To himself it was a special pleasure to see these large engineering works, similar in extent to those which gas engineers were sometimes called upon to carry out, going on, as well as to visit the beautiful district in which they were situated. The Corporation Gas-Works. To himself it was a special treat to have the members there, and the effect of the report of the meeting was of such a character as to considerably improve their standing as a body. There were many members of the Halifax Corporation Gas Committee who seriously regretted that they had not been present, and he thought that they had been properly invited, or they said they would have taken part in the gathering. He believed that in going from town to town in this way the Institution would be leaving a beneficial effect behind them, while they might also learn much that would be of value to themselves. At that meeting they had three papers read. Mr. Collins, of Bolton, contributed one on the impurities of the gas, which was very interesting, and was well received, and with which papers were usually received, was to his mind a very sensible paper. The second paper was by Mr. Eastwood, on coal seams and their stratification. He did not know whether any of the members who were not present at the meeting when this paper was read had read it over, but he thought that it was a very valuable paper, and he thought that the statement that the paper was the most valuable one which they had had, or which had been given of recent years in connection with gas institutions in this country. He considered Mr. Eastwood's paper a novel and most valuable contribution, and if they had only had this paper he thought they might rest very well satisfied with what they had done. Mr. Voevvers had also read a paper on the use of the gas in the manufacture of soda, and the "Standard" scrubber; while on the programme of the business for the present occasion they had another paper on a kindred subject. Such contributions were valuable, because they enabled the members to accumulate information, and so to improve themselves in the management of their several concerns. He thought that the members who were present at the meeting on retorts, by Mr. Chadwick, of Oldham, and on the elimination of the light oils from the tar, by Mr. Ball, of Leeds.

In conclusion, he said he was pleased to see so large an attendance of members. Their presence made the success of his presidency a certainty. He was very pleased to have been President over such a successful term, and to be able to refer to such a programme of work done as he had mentioned.

The reading of papers was then preceeded with.
(To be continued.)

EXAMINATIONS IN "GAS MANUFACTURE."

The City and Guilds of London Institute for the Advancement of Technical Education have just issued their programme of the technological examinations to be held by them next year; and we may state, at once, for the benefit of those intending to enter, that all communications with respect to these examinations should be addressed to "The Director and Secretary, City and Guilds of London Institute, Gresham College, London, E.C.", the envelope being endorsed "Technological Examination."

The examinations will be, as formerly, in three grades; but the order will be reversed, No. 1 being the elementary grade (intended principally for apprentices &c.); No. 2, advanced grade (for journeymen); No. 3, honours grade (for masters). Candidates will be allowed to enter themselves for any grade they choose; and there will be no limit of age. The examinations for 1881 will be held on the evening of May 25, in the local centres to be appointed, or, failing the fixing of such a place, in London.

Certificates (first and second class) will be awarded to successful candidates in each grade. To obtain the full technological certificate, candidates will be required to have passed the Science and Art Department's examination, in the elementary stage at least, in two of certain science subjects which are named in the syllabus of the several technological sub-

jects, unless they can give evidence showing that they have obtained the necessary preliminary scientific knowledge. The Institute will accept as evidence of the candidate's knowledge of the necessary science subjects:

A certificate stating that the candidate has obtained a degree or licence at one of the Universities of the United Kingdom; or 2. A certificate—from a Professor at one of the following institutions (the list to be added from time to time): Any University of the United Kingdom; the City School of Science and Technology, London; the College of Science, University College, London; King's College, London; Owens College, Manchester; Yorkshire College of Science, Leeds; University College, Bristol; Mason's College, Birmingham; the Royal College of Science, Ireland—stating that the candidate has attended a course of instruction, under a Professor or other person named, in such subject as may be required by the Board for technological subjects in which the full certificate is claimed, and has passed an examination in such science subjects satisfactory to the Professor. Candidates who pass in technology alone will receive a preliminary certificate, whereas those who pass in both parts will receive a full certificate, when they produce evidence of having passed in science.

The following prizes will be given in each subject, provided the merits of the candidates justify the Examiners in awarding them:—

Honours . . { 1st prize, £5 and a silver medal.
 { 2nd prize, £5 and a bronze medal.

(1st prize, £3 and a silver medal)

Advanced . { 1st prize, £3 and a silver medal.
 { 2nd prize, £3 and a bronze medal.
 { 3rd prize, £2 and a silver medal.

Elementary { 1st prize, £2 and a silver medal.
 { 2nd prize, £2 and a bronze medal.

The Examiner in the "Gas Manufacture" section will, as last year, be Mr. A. Angus Croll, A.Inst. C.E.; and the list published of questions which will be included in the examination, though it will not necessarily be confined to these subjects, is the same as was given for this year's examinations, and printed at length in the JOURNAL for Sept. 30, 1879, p. 511.

TAR AND TAR PRODUCTS AT THE RECENT GLASGOW EXHIBITION.

In connection with the recent Glasgow Exhibition of Lighting and Heating Appliances, &c., were several displays of the secondary products of gas manufacture; among others one by Messrs. Burt, Boulton, and Haywood, who prepared for the Committee of Jurors an explanatory statement regarding the specimens exhibited, some notes from which may interest our readers.

Products from the Distillation of Coal Tar.—When it is distilled, usually in an iron vessel or retort, three classes of crude products are obtained from the first operation—(1) the oils lighter than water, coming over at the low temperatures; (2) the oils heavier than water, coming over at most temperatures; and (3) the residue, or pitch, which, in the retort after the distilling operation is finished, which residuum runs out from the still in a viscid stream, and solidifies upon cooling. During the earlier period of the history of gas lighting no adequate market could be found for these products; and the first step was taken when Mackintosh popularized the use of india-rubber for the manufacture of waterproof clothing. The first use of the products of the distillation of coal tar was as a caoutchouc, but it was found to be too expensive, and it transpired that the light oils or naphthas of coal tar would answer the same purpose when refined. Hence the first step in utilizing coal tar was to boil it down merely for the purpose of removing the lighter portions or naphthas. Later on it was discovered that the residue could be used for the purpose of making a substitute for asphaltum, and the word "asphaltum" was spoken of under the general term of "creosote," were the best possible preservatives to be applied to timber, both to prevent decay, and to protect it from the attacks of insects and other animal organisms; and it was at this stage, about 33 years ago, that Messrs. B. P. Boulton, and Haywood, commenced the operations of these products. The heavy oils and kerosine, sometimes used successfully as fuel in steam boilers, and the liquid fuel, with a suitable burning apparatus, doing the duty of twice its own weight and bulk of ordinary coal. Having thus found uses both for the light and heavy oils of coal tar, the residuum or pitch was still a waste product of comparatively small value, but the introduction of the manufacture of gas for lighting, and the use of the pitch in the manufacture of waste coal from the mine, and grinding it up with about 10 per cent. of coal-tar pitch, and subsequently heating the mass and subjecting it to great pressure, it was found that a solid cake or "briquette" could be formed, as hard as the original lumps of coal; and as the material was cast in a mold, and the waste coal was broken up into small pieces, separate and softer, the quality of pitch is also manufactured and used for road pavements in the ordinary asphaltum process.

Refined Products from Crude Naphtha.—When the firm first commenced the manufacture of tar products, the light oils had only two uses, being employed for dissolving india-rubber, whilst the rougher or heavier oils were used for the manufacture of kerosene and lamp oils for other purposes. The discovery of the aniline dyestuffs produced a great revolution in this respect. Owing to the researches of Hofmann and other chemists, it was found that the coal-tar naphthas contained in their bulk a substance which, when purified, yielded aniline. This substance is called *aniline*, and is a colorless liquid, which, when subjected to fractional distillation and rectification. This compound, when treated with nitric acid, produced nitro-benzole—a yellowish compound, with an odour closely resembling that of oil of bitter almonds, and as such it is used in the manufacture of the various kinds of aniline dyes. The discovery of aniline led to a further series of uses, and its various compounds into aniline, toluidine, and xylene.

Separate Group of Products from Coal Tar.—The discovery of the wonderful disinfecting qualities of carbolic and cresylic acids, and the use of these chemical compounds upon a large and increasing scale for such purposes, as also for the manufacture of another series of colours obtained from phenol, have led to the separation and production of these acids upon a large scale, both from the light and the heavy oils of tar.

pends upon a large mass, both non-volatile and all heavy volatile oils.

Anhydrous croresote is obtained by heating the heavy volatile oil, used for the preservation of timber, until this substance is found in many cases to be charged with a series of semi-solid compounds, such as naphthalene, anthracene, chrysene, &c. For many years these compounds (which generally went by the name of "croresote salts") were a great hindrance to the creosoting process, as they solidified in the injection cylinders, choked the pipes, and interfered with the proper impregnation of the timber. In order to obviate this inconvenience, the croresote was heated

by steam pipes used to liquify these semi-solid substances; but the remedy was only partial, and for many years these so-called salts were cleared out from the cressote tanks and reservoirs, mixed with sand, and thrown away. In 1900, however, the Turkish Government, realizing the becoming of great value in Turkey-red dyeing and printing on cotton, which is largely done with artificial alizarine obtained from anthracene, Anthracene is separated from the heavy oils by filtering and washing with water. The residue is then subjected to a chemical oxidation it is subjected to the first oxidation process, by which the anthracene becomes transformed into anthraquinone. By subjecting this compound to a further series of processes it is converted into alizarine in a commercial form. In the United States, where the anthracene is obtained from the Brimley and Graywood, there were seen some beautiful specimens of

dyeing and printing executed with the alizarine which they are in the habit of supplying to some firms in the neighbourhood of Glasgow.

Naphthaline.—The utilization of this semi-solid substance contained in the heavy oils of tar is not yet complete on a large scale. In a refined and compressed state it is, however, used for increasing the illuminating power of the gas-carbon process, and its preparations are in use for manufacturing still another series of coal-tar colours, the specimens called naphthalin being the basis of a most interesting series of dyes.

RAMSGATE LOCAL BOARD GAS AND WATER SUPPLY.

GOVERNMENT BOARD INQUIRY.

The Ramsgate Improvement Commissioners having made application to the Local Government Board for authority to borrow certain sums of money—among others, £20,000 for gas-works purposes, and £5000 on account of the water-works—Mr. ARNOLD TAYLOR, one of the Board's Inspectors, held an inquiry on the subject, on Tuesday, the 23rd ult.

Mr. A. H. HENMAN (the Clerk to the Commissioners) said, in regard to the £20,000 required for the gas-works, the Inspector would remember, in consequence of several inquiries which had been held, the circumstances in which the Commissioners were placed with respect to the gas supply. In the year 1877 the Commissioners obtained an Act to take over the works, and in January, 1878, they acquired them. At the time they went to Parliament for the necessary powers, they knew little of the absolute requirements of the works. They knew they were valuable, and were advised professionally that they were justified in paying certain sums of money for them; but not possessing the works, they could not tell their constituents. About a year's possession of the works, however, revealed that considerable extensions would be required; not that the works were out of order, but that a great extension of them was necessary to carry them on properly. It had been noticed that after a local authority acquired works of this kind a great extension of them generally became necessary, and the Commissioners soon found that extensions were not made in the works they would be unable to supply the town in a satisfactory manner. The Engineer of the works (Mr. Valon) had all the estimates, and he would explain any matter the Inspector wished. He (Mr. Hubbard) might add that at first the Commissioners raised a capital of £80,000, the amount prescribed by the Act. They afterwards ascertained that this would be insufficient for work of extension, in order to meet the requirements as they had estimated them for the next seven or ten years. In December, 1879, they accordingly applied to the Local Government Board for powers to raise this money, and Mr. E. H. Wodehouse inquired into the application, and the whole matter was thoroughly explained to him. In March, 1880, the Board gave them authority under a Provisional Order, and the question then arose as to how they were to get through this and next winter. The Commissioners decided that in order to ensure the necessary supply of gas they must set to work at once, and the needed extensions had been commenced. They were now in a hurry, having to get ready to raise £90,000. Mr. Alfred Lass, the Accountant to the Commissioners, was present, and he would give the Inspector all the figures in regard to the gas undertaking up to the 29th of September of the present year.

Mr. Alfred Lass then handed in a statement of accounts of the gas-works. He said that including the £95,000 for the purchase of the works, there was up to Sept. 29 last an expenditure of £95,697; and having only power to borrow £90,000, the Commissioners had overdrawn the account, the money being expended on some works which would be mentioned by the Engineer. He added that nothing had been charged against capital account for renewals, but only the extensions of the works.

Mr. W. H. Valon also handed in a statement showing how the money was to be expended. He said the Commissioners had expended £86,609, which, with a working capital of £5225 and the money they would borrow, would meet their requirements for the next eight or nine years. To arrive at the probable requirements of the place at that time, Mr. Valon calculated an increase from 1870 to 1879, and estimated at the same rate from 1880 to 1889.

The INSPECTOR: You are really looking to your wants ten years ahead. Mr. Valon replied that this was so, and that during the next ten years they had powers to raise, with the permission of the Local Government Board, £100,000, and now only £90,000. They proposed to spend £4509 for a retort-house and coal store (his estimate for them having been £4500); £228 17s. 5d. for floor plates; £1069 10s. for some of Mr. West's stocking machinery, the Gas Committee having decided to adopt that system; £434 9s. 4d. balance for girders and condenser-pipes; £564 12s. for lifting machinery; £780 10s. for gas-lift pipes and valves; £250 for new wort-bouches and fittings. This gave a total of £101,951 3s. 6d., as against the capital raised and expended—viz., £86,609, leaving a balance of £21,361 3s. 6d.

In reply to the Inspector, Mr. Valon said the Commissioners had reduced the price of gas from 3s. 9d. to 3s. 6d. per 1000 feet, and then allowed a further rebate of 4d. which made the price of gas 3s. 2d. per 1000 feet, and at the same time 4d. of the price went to the general district rate, as provided by the Act, thus really making the price to the consumers only 2s. 10d. per 1000 feet. The Commissioners hoped to do better when the works were fully complete.

The application for the water-works loan was then taken into consideration.

Mr. Lass handed up another statement of accounts with regard to the water undertaking. The amount of capital expended, including the purchase of the works, up to Sept. 29 this year, he said, was £88,232, the capital already raised being £90,000.

Mr. Valon explained that the Commissioners had recently increased their supply of water by transacting and making additional works in Newlands, this being rendered necessary by their affording constant supply in certain parts of the town. They had a good supply at their new works, and, in fact, they could not yet form any idea of their resources, as the pumps had not lowered it to any appreciable degree. To go on with the constant supply it was necessary to have new works, which would cost £2625 11s. 7d., in order to supply the upper part of the town. The tank for the tower would cost £2256 17s., and would hold 250,000 gallons, thus ensuring a good water supply to all parts of the district. They proposed to have two services—a high and a low level. They would require new works to supply the low level, and a new service for the high level, and these, with the cost of the labour employed and the valves, services, &c., would be £2500. In addition to these, there was a balance of £900 due for pumping mains. All these proposed improvements brought the total expenditure to £96,238, as against the £90,000 borrowed. They therefore needed £6,238 to be loaned to the Board, and the water-works department, the water rates being paid in advance.

In reply to the Inspector, Mr. Valon said they already had a constant supply at the lower parts of the town, but they could not get it to the higher parts until the work now contemplated was completed. They had raised the price of water to the Board of Trade, and the Railway Company, but they had lowered the rate. The Commissioners might have to increase the charge for water when the constant supply was put

on. If they went to Minster, they could compel the people there to take their supply.

Mr. HUBBARD said they applied to borrow the money for 80 years.

The INSPECTOR: That time is understood by the Act.

Mr. Valon said the Commissioners were not obliged to put money into a sinking-fund yet, but they had already done so. He further stated that the Government would contemplate any other large expenditure for a good many years to come.

The inquiry then closed, the INSPECTOR remarking he should report in due course to the Local Government Board, who would advise the Commissioners.

Mr. Taylor afterwards went to the gas-works to view the new buildings now in course of construction. He expressed himself highly pleased with them, the general arrangements for the carbonization of the coals, and the machinery in connection therewith, meeting with his entire approval. In the after part of the day he visited the water-works at Southport. The building itself he much admired, both on account of its strength and structural appearance. The design of the high-level tank and the main supplying it were fully explained by Mr. Valon, and with them the Inspector also seemed much pleased, incidentally making the remark that he was always glad to see public works well designed and carried out efficiently, and in all the works he had that day visited the Commissioners had evidently been well advised.

THE GAS APPARATUS EXHIBITION AT BLACKBURN.

PRESENTATIONS TO MESSRS. OGDEN AND THOMPSON.

The Exhibition of Gas Apparatus inaugurated by the Corporation Gas Committee at the Victoria Hall, Blackburn, on Wednesday, the 24th ult., after a fortnight's run, during which time upwards of 9000 persons were admitted. On the Saturday before the closing of the show no less than 1700 people visited the building, and much interest was manifested throughout, especially in the Cooking Lectures delivered by Mrs. Thwaites, of the Liverpool School of Cookery. A pleasing feature of the concluding ceremony was the presentation, by the exhibitors, of two handsome timepieces to Mr. S. R. OGDEN, the Engineer and Manager of the gas-works, and to Mr. W. Thompson, the Secretary of the gas department, in recognition of the services they had rendered in making the exhibition a success.

This project was started by two of the exhibitors, and sufficient money was soon collected to carry out the object in view. The exhibition closed at 9.30 p.m., and immediately afterwards an adjournment was made to the Council Chamber by the exhibitors or their representatives, and Mr. OGDEN and Mr. Thompson, unaware of what was to take place, were called in.

Mr. OGDEN, who was called upon to preside, stated that it gave the exhibitors great pleasure to recognize in the way they intended doing the services rendered to them by both Mr. OGDEN and Mr. Thompson. It fell to his lot to present to both the handsome marble timepieces they saw before them. These presents were the spontaneous gifts of the exhibitors, who also wished to show their high appreciation of the kindness and courtesy of both Mr. OGDEN and Mr. Thompson. He hoped that each present would serve as a small memento of the exhibition.

Mr. OGDEN, in responding, said it was with extreme pleasure that he thanked them for their kindness in presenting him with so beautiful a timepiece. He could only say that from his youth up it had always been his ambition to use civility, and he had done his utmost to make the exhibition a success, and it seemed he had taken the right course. He had done his best, and if it had met with approval he was amply repaid.

Mr. Thompson, in acknowledging the gift made to him, said he thanked them for their kindness in presenting him with so beautiful a timepiece, and he also wished to express his high appreciation of the kindness and courtesy of both Mr. OGDEN and Mr. Thompson. He hoped that each present would serve as a small memento of the exhibition.

Remarks of a complimentary character were then made by a number of exhibitors; after which a vote of thanks was accorded to the Chairman, and an adjournment was made to one of the ante-rooms, where an excellent supper had been provided.

The proceedings were presided over by Mr. OGDEN, and Mr. Thompson occupied the vice-chair. The usual loyal and patriotic and other toasts were given, and a most enjoyable evening was spent.

THE GAS SUPPLY OF BARNESLEY.—At the meeting of the Barnsley Town Council on the 30th ult.—the Mayor (Alderman Marshall) in the chair—the gas question again came under consideration, and the resolutions passed at the meeting held on the 26th of October (see ante, p. 738) on the question of the charge for gas and the purchase of the gas-works, were considered. A deputation, consisting of three members of the Council, was appointed to wait on the Directors of the Gas Company on the subject. It had been previously agreed that no new lamps should be put up pending the settlement of this question.

SALFORD CORPORATION GAS SUPPLY.—The General Gas Committee of the Salford Town Council have just prepared their report on the operations of the Gas Department during the year ended March 25 last. They state that, in the twelve months, the quantity of gas used and sold was 628,965,300 cubic feet, an increase of 211 per cent. on the previous year. The average illuminating power was equal to 20 standard sperm candles. The rental from private consumers for gas was £90,966 11s. 8d.; meter-rents, £2736 12s. 6d.; public lamps, £10,222 10s. 2d.—total, £109,915 14s. 4d.; corresponding period, £118,451 10s. 4d.; decrease, caused by reduced prices, for the kindred year, £18,536 12s. 2d. The gas sold had been laid, also 12,494 yards of new mains in place of others of less dimensions. The gross profit was £43,563 8s. 4d., compared with £44,573 4s. 8d. in the preceding year; and it was appropriated as follows:—To interest on mortgage debt, deposits, &c., £12,857 8s. 7d.; sinking-fund, £7692 12s. 5d.; amount to the Salford District, £2599; depreciation-fund general account, £10,288 11s. 4d. The remainder constituted the divisible profits, and amounted to the sum of £10,000, which has been apportioned proportionately with the consumption of gas in each district:—To the Salford district, £5004 19s. 14d.; to the Pendleton district, £2969 6s. 2d.; to the Eccles district, £129 12s. 9d. The satisfactory results of the gas department enabled the Committee, for the fourth time within four years, to recommend a further reduction in the price of gas, bringing the minimum price down to 3s. per 1000 cubic feet within the borough, a price the lowest at which gas is sold in the district. An extension of the works is in progress, a considerable quantity of new main-laying, and being laid in various parts of the district, and new offices, workshops, &c., are in course of erection at Lamb Lane.

LAMBETH WATER-WORKS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Tuesday, at the Company's Offices, Brixton Hill, when the Directors presented their report on the operations of the Company for the six months ended the 30th of September. In it they stated that during the half year 1816 houses and other supplies of water, estimated to yield an annual rental of £4608 18s., were connected with the Company's works. The capital account showed an expenditure in the six months of £29,460

39. 104. The total capital expended by the Company since the Metropolitan Water Act was passed, in 1871, has been £487,556 10s. 7d. The greater part of this sum has been expended in laying mains, &c., throughout a large extent of the district not yet built over, and in works for improving the quality of the water, increasing the facilities of distribution, and for storing constant supply. The Company's bond debt is £105,000, and has been divided into the last of the 1871 Act, £100,000, £10 per share, on certain of the whole, half, and quarter shares, and will produce, £1,892 10s. When the current bond debt is paid off, and the uncalled share capital issued under the Act 32 Vict., cap. 4, is paid up, a further issue of shares to the extent of £92,000 can be made, in accordance with the Companies Clauses Act, 1845. The revenue account showed an expenditure of £10,000 in the last year, and the expenditure for the corresponding half of the previous year, due to the steady and continued increase in the number of houses built in the district. Compared with the same period, the total increase in the expenditure is £4948 14s. 8d. The expenses which the Government Purchase Bill in the first session, and the Select Committee in the second session of Parliament during the present year have incurred, have been £10,000. The Government have been the subject of the opposition to the scheme of the Lower Thames Valley Main Sewerage Board for the establishment of a sewage farm at Molesey were £2070

5e.84. Hence the greater part of the increase in the expenditure already mentioned. The surplus transferred from the revenue account to the dividend and interest account was £49,685 7s. 4d. After payment of interest on the bond debt and the debenture stock, there remained an available surplus of £10,000. The directors then decided to declare a dividend of 7 per cent. Proprietors the distribution of a dividend at the rate of 7 per cent. per annum (less income-tax), which it was estimated would amount in all to £41,400, leaving a balance of £2039 to be carried forward. The Directors considered that the present position of the Company had added to the difficulties due to fake advantage as against the Company, of the quinquennial valuation (1880) under the Metropolis Valuation Act, 1869. The Company, however, had taken no advantage of this valuation of 1880, and in no case were their water-rents assessed upon any higher valuation than in 1875. In 1875, however, in the majority of cases, upon considerably lower valuation.

The Engineer reported as follows:

The new filters are reported as follows:

The two new filters which are going on satisfactorily. The service reservoir will be completed by the end of next month. The third filter, which is now being put up, will be finished in about three months and the fourth filter, which completes the set, is in an advanced state of progress, and will be completed in about a month from the present time. The buildings for receiving the new pumping-engines and machinery, for raising water to the filters, will be ready in about six weeks.

The whole of the works will, it is hoped, be completed, and the new filters brought into use in January next. The entire filtering area will then be sufficient to filter the water at the most approved rate of filtration, and it is anticipated that the quality of the water supplied will be improved. The Company's works generally are in good repair and efficient working condition.

In regard to the extension of the constant supply system, the Director reported in the following terms:—

[illegible]

The somewhat lengthy statement concludes in the following way:—

The report of the Select Committee of last session on London Water Supply has for some time been before the public. The Directors would observe with regard to parts of that report relating to the agreements made by the late Mr. E. J. Smith on behalf of the Government with the Companies—

(g.) That the market value of the shares to which reference is made by the Selection Committee was not considered in connection with the question by the Board. The fact of the Company had been mainly held as permanent investments, but little known about the market value of the shares. It was pointed out that the market value of the shares, what is called the "market price" was no indication of the real value of the shares. The object of the Directors in the negotiations was to secure to the subscribers capital at a low rate, and it was suggested that the question of the market value of the shares whether by way of annuities or interest derived from the shares, was not a matter of question back dividends did not arise in connection with the Company, nothing is said thereof having been agreed to by the late Mr. E. J. Smith.

The Chairman said he would like to see the evidence proposed to prove, rather than argue (altogether erroneously), that inasmuch as the percentage of increase in this Company's net water-renal in nine years was more than twice as much as the percentage of increase in the number of houses, it necessarily followed, and the Committee were bound to accept, that the increase in the rental value of the houses was due to the receipts was due to the rates having been revised—that is, raised. Even if that had been the cause of the increase of income, it would have been quite legitimate, but nevertheless, the argument that the increase in the rental value of the houses was due to the so hostile an argument will be further realised when it is stated that the total increase in the Company's income, due to a revision of rates, in the seven years ending Lady-day 1897, was £5377, or less than £900 a year out of the total annual rental that date was £68,897.

(c.) The Company's income for the year ending March 31 last was actually in excess of that allowed by the late Mr. E. J. Smith for the year ending June 30, 1881, by \$183 and with regard to the increment, the increase of rental in the last half year is more than was anticipated, and 418 more houses have been laid on during the past twelve months than in any previous like period.

(d.) A further error on the part of the Committee arose from their having called and been guided by evidence given purely from an accountant's point of view, to the effect that the rate of expenditure on the reservoirs was not excessive. This was not the case, and had taken place, it must be assumed and calculated that the same rate of capital expenditure must necessarily continue in the future, and so postpone the increase of income as a result of the reservoirs. The Committee were told that the rate of expenditure on the Company who had spent most and done everything necessary to put their works on a permanent good basis, must continue to spend most in the future. The Lambeth Company, who had spent least, were told that they must spend most in the future. As to Molesey, and there constructing large subsiding reservoirs, building on suitable high ground spacious new service reservoirs, extending the filtration area, and putting their works on a permanent good basis, it was pointed out that the rate of expenditure on the expenditure will not, of course, recur, the argument for the reduction of increments indicated by the evidence adduced to cannot be sustained, while the increment agreed

(e) With regard to the possibility of some public body obtaining the sanction of Parliament to establish a competing supply with the public funds, the Directors would observe that the preambles of this and other Companies Acts of Parliament state that the money of private enterprise is called in to do a work which Parliament has decided to be "for the public benefit," no public authority having come forward as able and willing to do the work. In fact, private enterprise has stepped in because of the default of public

[illegible]

BOMBAY GAS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held at the London Offices, Drapers Gardens, Throgmorton Street, on Thursday, the 25th ult.—D. T. EVANS, Esq., in the chair.

The SECRETARY (Mr. W. Marshall) read the notice convening the meeting, and the following report and statement of accounts were presented:—

Your Directors have pleasure in submitting a statement of accounts, duly audited, for the half year ending the 30th of June last.

The gas and meter rental, as compared with the corresponding half of last year, also with that of the half year ending the 31st of December, shows a steady increase. The sales of residual products show also a satisfactory advance.

and the results of the year have been such that the balance of the account is still in debit, and still is adverse for remittances to England; but as some of the remittances have been made in advance, the balance of the account of remittances to England has been brought over during the six months, no loss has been incurred. In the meantime, the Company's funds have largely accumulated in Bombay; these, placed on deposit, bear interest at 5 per cent. per annum. Your Directors, watching closely the exchanges, were enabled to bring home recently a large sum at a favourable rate, and this they hope to do again. To provide against losses on remittances, which must occur during the current half year, your Directors have charged to the credit of the account a sum of £2500, which they have placed to the credit of exchange equalization account.

After eight years of continuous service in Bombay, the Engineer and Manager, Mr Scott, came to England on three months leave, but has returned and resumed his duties. The amount at the credit of profit and loss for the half year is £3757 19s. 3d., which added to the sum of £105 12s. 6d. brought forward from last half year makes a total of £3863 11s. 11d. available for dividend. Out of this your Directors have declared an interim dividend of 34 per cent. for the half year, clear of income-tax, leaving a balance of £463 11s. 11d. to be carried forward.

The interim dividend will be payable on and after the 1st of December next.

Dr.	<i>General Balance, June 30, 1880.</i>		Cr.
Capital authorized— (50,000 shares, at \$5 each— \$250,000.)			Construction account . . £203,662 5
40,000 shares, £5 paid	£200,000 0 0		Retort accounts 1,376 18
10,000 shares, £4 paid	40,000 0 0		Services account 215 15
			Goods in transit 215 15 1
			Stocks, viz.—
			Chandlery, brackets, &c. . . 4,519 7
			Brazes and iron goods . . . 5,103 12 1
Amount owing by the Com- pany	9,162 17 1		Main services, and tools . . 1,635 15 1
Reserve-fund (equalization of dividend)		311 12 8	Meters 3,327 12 1
Reserve-fund (for depreciation of plant, &c.)	£2,775 14 7		Coal 12,729 5 3
Written off	538 12 10		Residual products 4,940 11
			Amount owing to Company
Exchange equalization acct..	3,500 0 0		Invested funds per Cent. Government 4½ per cent. Debiture Railway Loan
Insurance-fund	1,920 14 0		Cash at Bankers, on deposit, and in hand, viz.—
Passage-fund	27 2 2		In London 6,765 14 6
Balance to general revenue	8,863 11 11		
	£266,162 19 10		
			£266,162 19 10

Profit and Loss Account.			
Coal carbonized	\$3,079	7	3
Wages	1,190	5	9
Purifying	29	2	3
Trade and general charges	674	0	0
Salaries and Collectors commission	1,803	17	7
Rents, rates, and taxes	373	16	4
Directors & Local Audit Committee's remuneration	701	5	0
Bad debts	15	10	11
Law charges	3,500	0	0
Exchange account	8,757	19	3
Balance			
	<u>\$25,135</u>	<u>13</u>	<u>11</u>

General Revenue Account.	
Balance carried down.	£8,863 11 11
Balance, Dec. 31, 1879	£9,705 12
Less dividend paid June 1, 1880	9,600 0
	£105 12
Balance for half year end- ing June 30, 1880	8,757 19
	£8,863 11 11
Balance for appropriation . . .	£8,863 11 11

THE CHAIRMAN, in moving the adoption of the report, said the report and accounts before the meeting spoke for themselves, though he might be able to supplement them with some statements that would perhaps be interesting. The Shareholders would observe that there was a corresponding period of last year, of £189. This was a small amount, and he knew some disappointment had been experienced and expressed by gentlemen who had recently joined the Company, that though the Board stated from time to time that the dividend was small, it was not really so. It was not an advance. To go back—say for seven years—in the June half of 1878 the quantity of gas sold was 10,047,000 cubic feet, while in the half years under review it was 12,668,000 cubic feet. It might be said that this was not very much more than the quantity sold in the half years of 1877, which was 12,616,000 cubic feet. In the December half of 1878 the gas sold was 10,093,000 cubic feet, and in the same period of 1879 the figures were 12,219,000 cubic feet. This was for the private lights; and, as he need not refer to the public lighting, he would not say more than that the quantity of gas sold was more than double that of the private consumption. There were various reasons operating against the Company in the matter of increasing the private lighting. It should be remembered that Bombay and an English city stood in very different relations to the Government. In Bombay the Government had no relations with the Native, and the Directors had, so to speak, to indoctrinate the natives, who were an inert and sluggish body, to move in appreciation of the advantages of gas. Nevertheless, he thought that the Company might congratulate themselves that, notwithstanding the fact that the natives were in a very unimproving condition, they were among the four successive populations. It should also be borne in mind that India had had four successive years of famine, and was now burdened with a heavy

war, and it could not be otherwise than that this must have had a very serious effect on trade in Bombay as in other cities of the country; and if of trade, it must also have had a prejudicial effect on the revenues of the Company. There had existed strong motives for economy in Bombay. He might mention that twelve months ago, when the Chief Commissioner brought before the Municipality the Budget, proposing an increase of from 10 to 15 per cent. of the public lamps—it was not a very large increase, but it showed a desire on the part of the Chief Commissioner to extend the benefits of public lighting to various districts—the proposal was rejected on the ground that it could not be afforded. Then again there was the serious loss on exchange. These were some of the reasons why the Company were unable to pay a higher dividend.

Mr. H. S. WILDE asked if the rates were the same in 1873 as now.

The CHAIRMAN, in reply, said at one time the Company charged 7 rupees. There was a reduction in the charge for the private consumption between the periods mentioned, from 7 to 6 rupees.

Mr. H. F. STEPHENSON: It was in the former period 7 rupees, with an allowance for prompt payment, and it is now 6 rupees without any allowance.

The CHAIRMAN said in the coke, tar, and fittings there was the satisfactory increase of £718. There was a great increase in the sums deposited bearing interest in Bombay, where the Company now had a very large sum lying, because they could not bring it home without any loss. Last year it was 800,000 rupees, which was equal to £90,000. The Directors had been most carefully watching the exchanges, and had brought over £5000 at 1s. 9½d., and had given instructions for a further large sum to be sent over at this rate, and a still larger amount if the exchange should reach 1s. 10d. and upwards. They had had no more success, however, while, such was the credit of the Company here, that they could borrow at 1 per cent. above the Bank rate—at 3 per cent.—so that they had the benefit of 2 per cent. by this operation. They were, however, anxious to have the money sent home as soon as they could, and they were therefore, to represent, watching the exchanges very closely. They had had in the half-year no loss by the exchanges, because they had had no remittances; but they had thought it advisable to apply £3500 out of revenue to meet the loss which must occur in the current half year. During the half year their coal had cost them 1s. 6d. per ton more than in the corresponding half of last year, showing an increase of 1883. This was owing to higher rates of exchange. The Directors had had no remittances. He regretted to state that the leakage had increased from 10 to 16 per cent. This was in great part owing to a fracture of the mains by the Municipality, in the course of making some new sewers. A claim had been made by the Company's representative, Mr. Scott, who always watched their work with great care, and he had been successful in getting the Municipality to pay for the leakage, but he had no doubt that something would come out of the claim. The leakage was now reduced to below what was considered the normal amount—10 per cent. As regarded the stock of coal, the Company had derived great advantage from buying this article cheap, and freights being low. The Directors would think that it was very good if they put prices on the works which were 40s. per ton; but they were not placed there, they considerably below this figure. They had a stock of 4200 tons at the works, and 3000 tons in transit, so in point of fact they had provided for one year's supply. With regard to the works themselves, provision was made for depreciation, and they were kept in excellent condition; there was, in fact, nothing to be wished for in this respect. The Directors hoped the public lighting would extend. They had not been furnished with particulars of the Budget for this year, but he hoped the Municipality, as recommended by the Chief Commissioner last year, would be able to take 70 or 80 additional public lights. If the Government should do that they were very much pressed to do—bring out a loan for India, and come to India, and they would be able to do so—it would be greatly to the benefit of the Company. Instead of being able to divide only 7½ per cent., they could divide 10 or 10½ per cent. perfectly well if the exchanges were reasonably favourable. He remembered the time, since the Company had been formed, when the rupee was worth 2s. 2d. The rupee then disposed of about 100 to 120 rupees. Even now things were improving in Bombay, though as yet the Company had little profited by the improvement. He did not fear as to the future of the Company. The lighting had considerably increased by the new docks, and an important district was being built over which would require gas, so he thought the Directors were reasonably fair for the future.

Major W. F. Gordon seconded the motion.

Mr. NORTHVOY thought the Shareholders would be glad to have some information as to the large increase in the amount owing by the Company. There was also a little difference in the balance-sheet, in the shifting of the interest, but this was not a very material thing. He was pleased by the Shareholders having had the money as dividend. The increase in the Company's business was small, and he had hoped the balance-sheet would have shown something better. It was, however, matter for congratulation that the coke, tar, and fittings had increased, as it showed that the residual profits were no mean help to the dividend.

The CHAIRMAN, in reply, stated that the increase in the amount owing by the Company was due to their having been compelled to borrow from their bankers; but, as he had stated, they made 2 per cent. by the course they had adopted.

Mr. W. F. GORDON observed that his object in asking about the price of the gas was this: He was a Director of the Bombay and Baroda Railway Company, and he knew the officers did not use gas because of its high price. It seemed to him that the Directors might consider the question of reducing the price. A slight reduction would probably be a loss, but that the Directors might consider the advisability of making a large reduction. He considered the time when the gas was sold at 10s. per ton in Bombay might be taken at about double that charged here, but the price of gas was considerably more than double. Could nothing, he asked, be done to induce the use of gas for cooking purposes in Bombay? The price of fuel was high, and the inhabitants did not want fires for warming purposes.

The CHAIRMAN stated that the Directors had endeavoured, in every possible way, to introduce the use of gas for cooking purposes. They had sent out rings and various forms of burners for cooking, and what they were trying to do was to induce the use of gas for cooking purposes. They were expanding the area of use of the gas, and they had a number of houses in which they had consumed the coke, and there was a demand for them, and this would assist materially in keeping up the price.

Mr. WILDE considered the Directors might do more in the direction of inducing the use of gas, by advertising and calling attention to the matter by public exhibitions. He also thought the Directors might do more in the direction of inducing the use of gas, by advertising and calling attention to the matter by public exhibitions. He also thought the Directors might do more in the direction of inducing the use of gas, by advertising and calling attention to the matter by public exhibitions.

Mr. WILDE asked the total loss made in bringing over the £5000 referred to by the Chairman. He saw that the Directors had put aside £3500 out of last half year's revenue to meet the loss on exchange in the current six months. Did he think that another £3500 out of the present half year would cover the loss?

The CHAIRMAN said they could not possibly say. Every farthing that the rupee was under the nominal sum of 2s. was equal to 1 per cent. They brought home the £5000 at 1s. 9½d., so that this would be 14 per cent. below the 2s. They therefore only received £86 for £100.

Mr. STEPHENSON said that Mr. Wilde had suggested that the Company should make a large reduction in the price of gas. In 1876 they made what they considered a large reduction—10 per 100 feet—and he must say that the result was one very greatly dissatisfied at the result. Had this reduction been responded to in Bombay, the Directors would have been prepared, he thought, to make another large reduction. Suppose they acted on Mr. Wilde's suggestion, and did not get an increased consumption, the Shareholder would have to go without dividend. The question had been most carefully considered by the Directors. He did not believe the Shareholders generally would consent to the adoption of a course which would imperil the dividend they were now receiving. The Directors had tried one experiment, having reduced the price by one-seventh, and they found no adequate corresponding increase in the consumption. He therefore contended that they must wait before making a further reduction.

Mr. ALFRED PENNY said he knew of no company where the Directors were more anxious than in this to give the fullest information to the Shareholders, or where they showed more interest in the concern. The Company's gas and meter rental the corresponding half of 1879 was £20,211, and in the corresponding half year it was £20,400, a trifling increase; and remembering what the Chairman had said in reference to the lighting of the new docks, he thought it was very discouraging. As to reducing the price, had it occurred to Mr. Wilde to take into account the fact that 12s. really meant with them only 10s. 7½—that was all which came into their expenditure, and that the rest was paid to the Government for reducing the price, and those who were shareholders in other foreign companies, particularly those in South America, would remember that the price of gas there was £1—just double that charged by the Bombay Company, and the price of the coal with them was about the same as with the Bombay Company. Some of those companies also had to pay a charge, but they had an agreement with the municipal authorities at all events for the public lighting—that they should be reimbursed for loss by exchange. As far, therefore, as he was concerned, as an expert, he held Mr. Stephenson's view—that the experiment tried of reducing the price having produced no appreciable result, the Company ought to keep to their present price. He had no objection to the Directors attending to the fact that the rupee was slipping away, being used to maintain the dividends. He saw now that it was reduced to the vanishing point, and he wanted to know, in face of this fact, if the dividend was likely to be maintained. Judging by the market price of the shares, some people seemed to think that the dividend was not likely to be maintained; but he thought that whatever could be done would be done by the Directors. If the exchange should go up, and the Company received the money that appeared on the credit side of the account to divide, they would be very prosperous, but if they continued to lose £7000 or £8000 a year by the exchange, the dividend would have to be reduced to a very small amount. He thought that the Directors who had tried many gas companies in England over their difficulties. If the consumption increased, the Company would very soon get over the present difficulty. It was beyond the control of the Directors to increase the consumption, and he believed the increase would be trifling, even if the price were reduced. He thought they ought to reduce the amount put down in the balance-sheet to some fair rate of exchange—say 1s. 9d. or 1s. 9½d. He did not believe they would see the rate of exchange very much higher for some time to come.

Mr. WILDE said his reason for suggesting a reduction in the price of gas was this—that as there was comparatively no increase in the consumption, in spite of the spread of the mains and the increase of railway stations, he thought there must be some reason for it; and the only reason which occurred to him was the price.

Mr. C. GANDON stated that during the time he was in Bombay the question of the price of the gas was very seriously discussed. He then held the view that the Directors were not doing enough, and that the Company was concerned, to make a small reduction in the price. No doubt 6 or 7 rupees was a high price for gas, more especially when compared with the price of petroleum, cocoa-nut oil, and other lighting material; but any small reduction, such as a rupee, would, in his opinion, do very little to increase the consumption. If the price were reduced to 6 rupees, it might do so; but even then it would be doubtful, because the majority of the natives were satisfied if they could get a tumbler and put some cocoa-nut oil and a wick in it, and so get their light. As to the public buildings, he believed that whether the price was 6 or 7 rupees, the same amount would be paid for the gas. He thought that the Directors, if they thought it would be very rash to attempt to reduce the price by one-half, for he believed if they did the Shareholders would lose their dividend.

Mr. STEPHENSON said the question of the exchange had been fully thrashed out at previous meetings, and he believed that the Shareholders generally were of opinion that the Directors, knowing all the circumstances of the Company, were right in continuing the course hitherto followed. As to the amount now owing by the Company, £8000 of it was due to their bankers for a loan against the money they had in Bombay. He agreed that there was no objection to showing the items separately, as suggested, and it would perhaps be more clear to do so. As to the result of the exchange, it was £311, and it was not a very small amount, but there was an exchange equalization account of £8500. His belief was that their loss by the exchanges ought not to be more than from £5000 to £6000 a year. He did not take a very rosy view of the position of the Company; but he was very far from having arrived at the conclusion that the Directors were not doing enough. He thought that the gas-rental for the past half year showed an increase of only £200 over the corresponding period of 1879; but, owing to the flooding of one of their mains (due to a fracture) a whole district was put in darkness for some time. In the month of June alone their consumption decreased 189,000 feet, followed in July by a fall of 159,000 feet. This was due to the fact that the gas was not being used, the mains being absent on leave at the time, a longer period elapsed than would have otherwise been the case before the damage was remedied. That was one of the reasons why the increase in the rental was not larger. Should the Directors find themselves pressed to reduce the dividend, he was not quite sure that they would not be able to increase the price of the gas if the exchanges continued so low.

The CHAIRMAN pointed out that the general balance also showed that they had £1842 invested in the Victoria Government 4½ per cent. railway loan; and this was now £2000, being the investment of the insurance-fund.

The motion was then put, and carried unanimously.

Mr. NORTHVOY, after expressing his belief that Mr. Stephenson's concluding remarks were right as to the dividend being maintained, moved a vote of thanks to the Chairman and Directors.

Mr. WILDE seconded the motion, and it was carried unanimously. Mr. NORTHVOY, in reply, expressed the acknowledgments of his colleagues and himself, and assured the Shareholders that they would continue in future to do what they had done in the past—their very best in the interests of the Company.

The proceedings then terminated.

METROPOLIS WATER SUPPLY.

The following are the returns made by Dr. C. Meynott Tidy, on the Composition and Quality of the Metropolitan Waters in November, 1880:—

[The results are stated in grains per Imperial gallon of 70,000 grains.]

NAME OF WATER COMPANIES.	Total Solid Matter.	Oxygen required by Organic Matter, &c.	Nitrogen. As Nitrates, &c.	Ammonia.	Hardness (Clark's Scale).	Before Boiling.	After Boiling.
<i>Various Water Companies.</i>	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.	Degs.
Grand Junction	22.42	0.071	0.146	0.001	15.4	2.4	
West Middlesex	21.83	0.128	0.146	0.001	15.4	2.4	
Southwark and Vauxhall	21.83	0.128	0.146	0.001	15.4	2.4	
Chichester	21.75	0.041	0.156	0.001	15.4	2.4	
Lambeth	23.03	0.031	0.167	0.006	15.4	2.4	
<i>Other Companies.</i>							
Kent	32.02	0.000	0.413	0.000	22.4	5.6	
New River	22.91	0.004	0.198	0.000	15.4	2.4	
East London	22.53	0.077	0.177	0.000	15.4	2.4	

Note.—The amount of oxygen required to oxidize the organic matter, nitrates, &c., is determined by a standard solution of permanganate of potash acting for three hours.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, the Grand Junction Water Company.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The Corporation of Glasgow, like many others I could mention, have no reason to be dissatisfied with the results following upon their acquisition of the gas-works; but in view of the proceedings of the Gas Commissioners, which have just been published, it is questionable whether the gas consumers of the city will feel at all gratified. No doubt the Corporation has been able to put the gas more cheaply than the private companies in former days, and they have also maintained a high standard of illuminating power. For this they deserve credit, as well as the best thanks of their constituents; but it is perfectly evident that they have not reached the lowest limit of profit on the make of gas, else less would have been said about a "handsome surplus" than has been the case. The natural reasoning of nearly every person interested in these matters is that the profits realized, if not arising from any exceptional occurrence or event, should go to reduce the price at which the manufactured article ought to be sold. Unfortunately for those more immediately concerned with the making of gas, corporations, from the sale of gas, the Corporation practically saddle the gas consumers with the expense of the improvements and allow the non-consumer, who is equally, as a citizen, bound to pay for improvements, to go free. Apart, however, from this, there is the further consideration that every opportunity is seized by those interested in the establishment of the electric light to draw competition, and thus to save on the score of expense, and it therefore behoves corporations to see that they not only manufacture gas at the least possible expense, but that they sell it with the narrowest margin of profit.

Unlike Helensburgh or Kilmory, the Police Commissioners of Alva, a small town in Perthshire, have been obliged to stop the Burgh Gas Supply (Scotland) Act, 1876. The movement to acquire the gas-works of the town originated several months ago, and at a meeting of the Commissioners on the 22nd of September last it was resolved unanimously to adopt the Act. An election has intervened since the resolution was come to, and on the 29th ult. a meeting of the Commissioners was held to consider the execution of the matter. Chief-Magistrate Donaldson, who presided, said that since the meeting in September he had seen no cause to change his mind in regard to taking over the gas-works. He believed that the confirmation of the prior resolution would be for the profit and benefit of the ratepayers, and he therefore formally moved the adoption of the resolution. The motion was unanimously approved of, and the usual notices will consequently be served upon all parties interested.

In the number of the JOURNAL for the 23rd ult. I mentioned that the Corporation of Montrose had resolved to adopt the Burghs Gas Supply (Scotland) Act. It would now seem that the policy of the Corporation is not to be allowed to have been ignored more than this does not appear remonstrances, said to be numerous, signed, were lodged with the Town Clerk of the burgh, against the transfer of the gas-works to the town. Of course, this action will necessitate a poll being taken.

A question has arisen in Inverness, the capital of the Highlands upon the point of pecuniary importance to the town. At the last meeting of the Gas and Water Commissioners, on the 25th ult., Mr. J. H. Mackenzie desired the Gas Manager to explain how it was that gas at 6s. 6d. per 1000 feet cost more in the long run than it did at 7s. 6d. per 1000 feet. He said that his experience had been that gas at the former figure cost him more than it did at the latter. It would appear, from the remarks made at the meeting, that there is a feeling generally prevalent in the city that the reduction in the price of gas per 1000 cubic feet does not in the slightest degree mean that the account at the end of the quarter is less than formerly. Of course, the first and most natural solution of the point is that the consumer has been imposed more than this does not appear to meet the difficulty. Perhaps some of the readers of the JOURNAL may be able to proffer a satisfactory explanation to Mr. Mackenzie.

I would ask that this question should be solved for another reason. I find the same complaint quite commonly made in Hamilton. The price of gas there has also been reduced, but many of the consumers, including even those who have adopted the most improved methods for economically burning gas, are loudly grumbling that their gas accounts are not only not reduced, but largely increased. If Bailey Cassels has not yet completed his inquiries to satisfy the queries which I put, two weeks ago, he might address himself to further question, and the result would require, in fact, to solve the problem, he will at least have done something in connection with gas management to merit the applause of his fellows.

A scheme has been adopted to supply North Queensferry with water from the Dunfermline pipes, and an intimation has been made to the Public Works Local Board that the Local Authorities would require to borrow not less than £2000 to finish the work. It should be mentioned that a protest was made against the scheme because it would give 60 gal-

lons of water a day to each individual. Had the protest been against the limitation of the supply, it might have been better understood.

Mr. Dallas, the Manager of the Inverness Water-Works, has had a busy time of it recently in trying to prevent the waste of water, and in this way to keep as large a supply as possible in store for the inhabitants. In many instances he has succeeded in effecting a great saving, and now, thanks to his exertions and the heavy fall of rain within the past week or two, the store of water in the reservoir is fast increasing. The reservoir now contains 6,109,000 gallons, or a gain of 1,698,000 gallons (60,000 gallons a day) since the 27th ult.

The scheme to lay down new pipes, with the view of strengthening and improving the carrying power of water from Lintrathie to Le Grange, has been abandoned by the Dundee Water Commissioners, but it is plain that unless action of some kind or another is speedily adopted the Water Commissioners and the people of Dundee will be placed in a very awkward predicament indeed. Sir George Kinloch, one of the proprietors of land through which the water-mains pass from Lintrathie to Dundee, has written to the Commissioners complaining of the injury to his lands by the frequent bursts, and calling upon the Commissioners to do something to strengthen the pipes in Strathmore. It will now come to be a question whether it would not be more advisable to lay an additional main to the endowment to strengthen the present one. Consideration of the question has been reserved.

The statistics which have been published this week relative to the Edinburgh water supply fully bear out my statements last week as to its abundance. The report which has been made up to the 30th ult. shows that at 25 feet the total quantity of water supplied to the town was 2,567,147,000 gallons, as compared with 2,319,975,000 gallons on the 16th ult. The delivery in Edinburgh was 12,183,000 gallons per day—equal to 40.63 gallons per head per day to a population of 304,300.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

A petition was heard yesterday in the Dean of Guild Court, Port-Glasgow—Bailie Cuthbert on the bench—on behalf of the Trustees of the Glasgow Gas Works, and of the Corporation of Glasgow, and other buildings in connection with the gas-works proposed to be erected on ground recently purchased by the Trustees, and which are intended for the manufacture of gas (as mentioned in the JOURNAL several weeks ago) for the purpose of supplying buoys similar to that which was placed by the Trustees on Glasgow Harbour, and which was intended to be manufactured from mineral oil, and it was brought out in evidence before the Court that there would be no chimneys in connection with the works, so that there was no likelihood of any nuisance arising from smoke. It is expected that the work of construction will be commenced forthwith.

The photometric testing of the gas supplied to the town of Greenock during last month showed, in 26 experiments, a minimum illuminating power of 25.00 standard candles, a maximum of 32.80 candles, and an average of 29.48 candles. As formerly mentioned, the experiments are made in the office of the Clerk and Collector, well-nigh two miles from the gas-works.

At the Thursday's meeting of the Town Council of Glasgow, sitting as the Gas Commission, the question of the disposal of £5000 from the gas surplus of last year was up for consideration. Mr. Walls, Convener of the Gas Committee, proposed that it should be handed over for the general purposes of the Corporation, the condition being that the same should be applied to the improvement of George Square. The proposal gave rise to some discussion, and an appeal to, and an interpretation of one of the sections of the Gas Act, and one of the members strongly urged that the surplus funds of the Gas Trust should be applied to the reduction of the price of gas for the poor, and for the benefit of the town. The Council resolved at the same meeting to write off 2½ cent. from the value of all the works, except meters, and charge the deduction to profit and loss. This resolution seems to have been arrived at in view of the possible competition of the electric light. The Gas Committee recently had an application for a loan of £1000 for the purpose of erecting a gas-works, and the Council resolved at the same meeting to write off 2½ cent. from the value of all the works, except meters, and charge the deduction to profit and loss. This resolution seems to have been arrived at in view of the possible competition of the electric light. The Gas Committee recently had an application for a loan of £1000 for the purpose of erecting a gas-works, and the Council resolved at the same meeting to write off 2½ cent. from the value of all the works, except meters, and charge the deduction to profit and loss. This resolution seems to have been arrived at in view of the possible competition of the electric light.

The annual monthly meeting of the Town Council of Kilmarnock was held last week, when the question of a new report from the Gas Committee which showed that £9000 of debenture bonds would become due next Whit Sunday, by which time £1500 would be available for the redemption of those bonds, and by anticipating part of the payment on account of sinking-fund, £2000 might be paid off, in which case only £7000 would have to be borrowed. During October 2,901,100 cubic feet of gas were sold, realizing £564 15s. 8½d., as compared with 2,779,000 cubic feet, value £536 17s. 1d., sold in the corresponding month of last year. The illuminating power of the gas made in October was—maximum, 28 candles; minimum, 26½; average, 26.9 candles.

At a meeting of the Police Commissioners of Wishaw, held on Thursday, the 2nd inst., the question of a new report from the Gas Committee to learn what was to be done, seeing that the proposed lenders of money for the gas-works objected to implement their engagements, owing to what they considered irregularities in complying with the terms of the Act on the part of the late Town Clerk. The memorandum submitted to the Committee was read, and it was seen that there was a difference with what was mentioned in the clauses of the Burghs Gas Supply Act. From the Lord Advocate there was submitted a lengthy and very clear opinion on the matter, which was to the effect that the Sheriff had supreme power in the matter, and that his decision was not subject to review, and that what had been done lately had covered any small previous irregularities.

Business was done last Monday in the Glasgow Corporation 6½ per cent. Gas Annuities at £164 per share.

The decision of the Town Council of Paisley to ask for parliamentary power to spend £100,000 on a new supply scheme is causing a good deal of discussion in Johnstone, which is supplied by the Paisley Water Commissioners. Considerable alarm has been created by the statement that a large increase in the rates will be necessary to meet the expenditure, and there is some talk of convening a public meeting of the ratepayers so as to have the matter discussed and their opinion obtained upon it.

There has been a quiet tone in the Glasgow pig iron warrant market during the week, and a large amount of business has been done daily. A recovery of 4d. per ton took place yesterday, but over the week there was a steady and strong selling, and the price has now, however, a few inquiries. The house coal demand is not busy. Prices remain without alteration.

THE PURCHASE OF THE COLCHESTER WATER-WORKS BY THE CORPORATION.

At the last Meeting of the Colchester Town Council, the Water Supply Committee presented a report which stated that the purchase of the water-works was completed on Oct. 27, on which day possession was formally delivered over to the Mayor, in the presence of the Town Clerk and the Mayor, so that the purchase was made on behalf of the town, now devolves on the Corporation. In regard to the cost incurred in carrying out the transfer, the Committee reported that the settlement of the purchase proceeded on the following statement of accounts, made out in pursuance of the agreement which was sanctioned by the Colchester Water Works Act, 1879:

Purchase-money under awards	£81,218 10 4
Interest (less property tax) from June 30, 1879, to Oct. 17, 1880	£5,111 1 2
Less balance on income account rendered by vendors up to Sept. 30, 1880	2,431 17 3
Interest balance	2,679 3 11
Moiety of Arbitrators charges	£941 1 8
Costs of action, and costs of other memoranda of April 17, 1879	900 0 0
Stamp duty on mortgages	29 7 6
	670 9 2

Total to be paid	£84,568 3 5
Amount of cheque given	£83,568 3 5

Purchase-money left due on memorandum . . . £1,000 0 0

The "memorandum" referred to in the above statement is the following, which was duly signed:—

That, inasmuch as the amount of the purchase-money, interest, and costs is so much more than the Corporation expected, and the amount claimed by the vendors on action cannot be paid by £1,000, the Corporation unanimously request the vendors to allow the £1,000 to remain unpaid, and without interest, to a day not later than the 30th of June next, before or by which time the Committee will see that this balance of £1,000 is left out of the part of the purchase-money, shall be paid; and, if not then paid, the £1,000 to bear interest at 4 per cent.

The report, after asking the approval by the Council of the Committee's arrangements, continued:—

In addition to the £1,000 balance of purchase-money paid, there are other claims in respect of the purchase still to be provided for, and in further dealing with this subject, your Committee recommend that all these outstanding claims should be ascertained as soon as can be, and that the additional amount required to discharge them should be provided. The estimate of the Local Government Board to the borrowing of any further sum for the purpose will be necessary, and in this view of your Committee, the accounts should be at once got in, and the matter brought before you at the next meeting of the Council.

Another and still more pressing point is the management of the water-works, and of their income and expenditure. It was before stated that possession was formally taken on completion of the purchase, and reviewing the past proceedings of the Council, it may be seen that, in respect of the water-works, the objects for which your Committee were appointed had, on such completion, been accomplished, and that their functions were ended. Your Committee think this is so; but the interests of the town would not permit interest to be taken, and the water-works to be left in the hands of the Corporation, and made a temporary arrangement, under which one or other of their number, the Treasurer, or the Town Clerk, has since daily visited the works. Your Committee also note provision by which the servants of the Water Company were continued, so that no interruption of the water supply has taken place.

All this, however, as you will see, intended but as temporary; and your Committee conclude their labours with a recommendation to you to appoint another Committee, which might now properly be designated the Water Works Committee, to whom should be delegated the entire management of the water-works and of the receipts and expenditure, of the water supply, whether voluntary or compulsory, to all persons, and to all bodies, and of the management of all water-works and payments in respect of water, and of all agreements with any person or body corporate for the supply of water, the giving of all or any notices in respect of water supply which may be required, and of all matters which may be necessary for the water-works, and of all matters of every kind relating to the water-works and their management. This recommendation is based upon the consideration that the property, and the duties for the management of it, are in the hands of the Corporation, and that it is necessary to give immediate attention, an oversight, and a care (often under emergency) that are utterly incompatible with a prior meeting of your body, which in its sanitary character has a regular monthly meeting, and would doubtless be specially convened more frequently if the suggested Committee thought it necessary.

Mr. BEAR moved that the report be received and entered on the minutes, and that all the transactions of the Committee in purchasing and carrying through the negotiations be approved and confirmed.

Mr. WICKES seconded the motion, which was carried.

THE LANCASTER CORPORATION WATER-WORKS.

THE PROCEEDINGS in the arbitration between Mr. Henry Garnett and the Corporation of Lancaster, which were opened at the Surveyors Institute, Westminster, on Oct. 11, before Mr. W. C. GULY, Q.C. (see ante, p. 612), and after occupying four days were adjourned to suit the convenience of plaintiff's counsel, were resumed on Friday, the 12th ult.

Mr. H. H. HIGGINS, Q.C., and Mr. H. H. HIGGINS, Q.C., appeared for Mr. Garnett; Mr. R. E. WEBSTER, Q.C., and Mr. R. S. WRIGHT representing the Corporation of Lancaster.

The first witness called was Mr. Bardsley, who testified to having gauged the springs on plaintiff's land, and gave the results. His examination was chiefly in regard to the water-works, and the entire day, on the following morning Mr. J. FARRAR, C.E., of Bury, gave evidence in support of that given by Mr. Bardsley, whom he had accompanied when gauging the springs, which he considered had been materially altered by the carrying out of the Corporation's water-works. Taking water from these springs would, he said, depreciate the value of the land for grouse-breeding purposes, and the fact that the servants of the Corporation would, from time to time, have to go on to the ground to examine the reservoirs, would also be an element of depreciation, inasmuch as an intending purchaser would see that he would not have the estate entirely to himself. In fact, the Corporation, by becoming joint owners of the property, depreciated it not only for sale, but for letting purposes. He treated the property as worth £10 an acre, and his total valuation amounted to £16,035.

Witness's statements and figures were confirmed by Mr. J. JACKSON, C.E., and Mr. FORSTER, C.E., and the proceedings were then adjourned.

On Monday, the 15th ult., the proceedings opened with the examination of Mr. A. WATERHOUSE, one of Mr. H. H. HIGGINS's assistants, who testified that he had gauged the springs on Mr. Garnett's estate. On the 24th of last May, Tarbrook had 68,780 gallons running per day. No. 2 stream was giving out 5295 gallons on the same day, and No. 3 stream was running 28,825 gallons. This was above the line of the Corporation's conduct, but before the pipes were laid. He took all his gauges as close as he could to the new conduit, and in all cases reckoned a day of 24 hours.

Other streams were running 5295, 2908, 860, and 1019 gallons per day respectively. Thorn Clough gave out 6673 gallons daily on its west branch, and 95,494 gallons on its east branch. Eight tributaries to a stream called Fall Clough contributed 85,163 gallons. Tarnsley Clough ran at the rate of 37,792 gallons per day. None of this water went into the conduit. Thurn Clough gave 55,004 gallons, and the next stream to the east 42,900 gallons. A number of streams, tributary to the Tarbrook Wye, gave 43,327 gallons, and the river itself 810,304 gallons. The whole of the water supply, apart from the river, was 544,635 gallons, and with the river it made a total of 1,354,839 gallons daily. He gauged all the streams that he found close to the new line of pipes, and they took their rise above the pipes.

This concluded the case for the plaintiff.

Mr. WEBSTER, in opening the case for the Corporation, said his witnesses would prove that after all the required water had been abstracted, there would be 30 per cent. left, and this would find its way down below the conduits of the Corporation. This statement was, he said, to a great extent borne out by the last witness examined on behalf of Mr. Garnett.

Mr. THOMAS GOW, an estate agent and valuer, who stated that he had examined the plaintiff's moor in May and October last. In May it was exceptionally abundantly watered. In October he considered the quantity of water passing the conduits of the Corporation was quite sufficient for grazing, grouse, and deer, and for agricultural purposes. He estimated the quantity *per se*, at the usual price of 1d. per yard, but as there would be exceptional damage for 10 or 12 weeks in the breeding and also in the shooting season, it might be necessary to have an extra keeper on the ground. He took 8750 lineal yards, at 1d. a yard at 25 years purchase, and £1000 to the estate. He also took an extra keeper at £180, calculating the cost at 20 years, or £24 a year. His next item was interference with sporting rights during construction, £50. This made £1491 9s. 2d., which he believed to be a fair compensation. He did not consider the moor was injured at all for grazing purposes.

Mr. J. J. DENT, a land agent, said he had been three times over Mr. Garnett's land, and never saw so many springs on a similar space of ground. There was a superabundance of water. His estimate of the compensation to which Mr. Garnett was entitled was—6100 yards of piping, parallel to the old piping, at 1d. a yard, £58 10s. per annum; 2590 yards of new ground, at 2d. a yard, £259 10s. 8d.; and 4290 lineal yards of new ground, at 1d. a yard, £429 10s. 8d., to which he added £50 for injury to the fishing, and £50 for extra disturbance, which brought his total estimate to £1592 18s. 8d.

On Thursday, the 18th, the proceedings commenced with the cross-examination of Mr. DENT, who quoted several cases of other moors in support of his figures in reference to the value of Mr. Garnett's estate.

Mr. J. MANSENG, C.E., was the next witness. He said he was engaged in connection with the water-works of 1853, and in the work purchased to the Act of 1876 he again advised them, and had been in all the work from that time down to the present. He described the various works on Mr. Garnett's land, adding that the total area of actual occupation by works under the Corporation Act of 1876 was 167 square yards.

The only area that was injured was 167 square yards. The Corporation were not entitled to the area of 1876, but the Corporation were sufficient to include any sporting rights Mr. Garnett might have, as the water-works were not such as materially to interfere with the value of the moor either for agricultural or sporting purposes. Section 19 of the 1876 Act bound the Corporation to leave sufficient water for agricultural purposes, and he had always been of opinion that when they left sufficient for agricultural purposes it would be sufficient for grouse. During the present year the rainfall had been below the average. He had gauged the springs on the 19th of October last, when the rainfall was very slight. The result showed that the yield from the 2700 acres of land was 1,000,000 gallons, and the yield from the 2700 acres of land was 1,000,000 gallons, and he calculated the yield would be reduced from 1,880,000 to 1,100,000 gallons, and the quantity left might be reduced from 441,404 gallons to 238,558 gallons. In his opinion the 2700 acres did not represent the real area of the watershed; he should be inclined to put it at 3477 acres.

He said that the land of the Duke of Devonshire's Lancashire and Yorkshire estates, and Westmoreland, and was now engaged by the Manchester Corporation in connection with their Thirlmere scheme. He considered the works of the Lancaster Corporation would improve Mr. Garnett's moor for the purposes of pasture, and would not deteriorate it for grouse-breeding. He estimated the letting value at 6d. an acre, and considered that £729 3s. 4d. would be ample compensation for the easement of 8750 yards at 1d. per yard at 20 years purchase.

The first evidence taken on the following day was that of Mr. T. FENWICK, C.E., of Leeds, who said that, in conjunction with Mr. Manseng, he had been over the whole line of pipe on Mr. Garnett's estate, and had inspected and gauged the springs and streams. He was certain that Mr. Manseng was very much below the mark in his estimate of the quantity of water, and that the water was 1000 gallons per acre, and that they had taken what they required, and he considered, in fact, that the moor would be improved by a large portion of the water now upon it being drained off. In his opinion Mr. Garnett ought to be quite satisfied if he received £1190 as compensation.

Mr. FENWICK, C.E., said his valuation of the easement of the 8750 lineal yards of pipes on the estate was, at 1s. 6d. a yard, £729 3s. 4d.; then he allowed 20 per cent. for compulsory purchase, £145 18s. 8d.; making a total of £875. There would be some disturbance of the game, and there would be a right of passage, and consequent interference with the property, and he considered in the 1s. 6d. by far the greater portion of which amount was for disturbance—about 1s. 6d. for disturbance, and 2d. for wayleave.

Mr. G. DREYER, agent for the Duke of Devonshire's Lancashire and Yorkshire estates and for Lord Chesham's estates, said he had visited the moor, and he considered that the moor would be injuriously affected, as far as grouse were concerned, by the works done under the Corporation's Act of 1876. The water he saw there was a good deal more than enough for grouse. His estimate of the value of the easement was £1093 15s. for the pipes; £50 for disturbance during the progress of the works; and £500 for an extra 1000 gallons of water for 20 years—total, £1743 15s. He should estimate the moor to be worth £150 a year for letting.

This concluded the case for the Corporation.

On Saturday, the 20th, the proceedings were resumed by Mr. WEBSTER addressing the Arbitrator on behalf of the Corporation. He said that the issue involved was a very large one, and of great pecuniary importance, and that he was sure that the Arbitrator would be able to moderate claim, and had been put forward on behalf of Mr. Garnett could

only be supported by disregarding the facts of the case. The first introduction of the Lancaster Corporation on to the estate of Mr. Garnett was in 1861, when Mr. Garnett was compensated for the intrusion, and he (Mr. Webster) submitted that it would require strong evidence to make the Arbitrator treat the matter differently now from what it was treated then. The first question was the letting value of the grouse moors as they now stood, and it had been proved that Mr. Garnett, jointly with another, leased an adjoining moor for about 9d. per acre, and when sporting rights became assessable, the Assessment Committee of the Corporation sought to assess Mr. Garnett's lands at 6d. per acre on the whole. But he resisted this, and finally the assessment was made at 3d. per acre on moor and fell, 1s. 6d. on the woodlands, and 6d. on the ordinary enclosed lands. The learned Counsel pointed out that Mr. Statter, one of the principal witnesses on the other side, had testified that the moor was worth £500 a year, and the two moors at £1000 a year. This was Mr. Statter's valuation of the right of shooting grouse over 800 or 900 acres, of which barely a quarter would be affected in any way whatever by the works of the Corporation. Would it not be monstrous, he asked, to tax the ratepayers on such an estimate, when it was shown in evidence by the plaintiff's own witnesses that one of the choicest grouse moors in Perthshire, of 8000 acres, including a residence, was let for £100 a year? The evidence on the other side was that for moors over which three times as many grouse per acre were not as over Mr. Garnett's estate, the price was 1s. an acre. Inverting to the question of the watershed, the learned Counsel pointed out that when the springs were gauged last October, after an unusual period of drought, the yield of water was found to be six times what it was estimated it ought to be from such an area. Some of Mr. Garnett's witnesses had said that the water would be six times what it was left in the streams, and that the Corporation would not be able to draw from this watershed anything like the quantity of water they required. But the Corporation were bound by the 19th section of their Act to leave at least enough water for agricultural purposes; and Mr. Statter had admitted that if the Lancaster Corporation were to take the water would be enough left for the grouse. As a matter of fact, the gaugings taken by Mr. Mansergh in a very dry season showed that even at such a time there would be more than ten times as much water left as the grouse would require. He submitted that £1000 would be ample compensation for Mr. Garnett, and on concluding his address, he asked the Court to award costs, with the costs of the application to revoke the submission to the former Arbitrator, Mr. J. F. Bateman.

Mr. HIGGIN pointed out that the Lord Chief Justice said it would be impossible for an award to have given the satisfaction which was given by the Arbitrator, and made no preliminary remark, but he was not to be taken by Mr. Bateman. With reference to the facts of the case, the learned Counsel said the Corporation had power to sell water in bulk at any price, and they would no doubt make the most they could of it for the benefit of the ratepayers. Mr. Garnett's estate was a perpetual reservoir for these waters, and created by that water had been a drainage pit for the water of the Act of Parliament. They intended to stop the water at Damagill, and, therefore, it must be assumed they were going to take their maximum quantity; and Mr. Mansergh, their Engineer, had himself shown that in dry seasons there would be a deficiency. A comparison had been made of the grouse-yielding power of the moor with moors in other places, but it must be remembered that Mr. Garnett, being himself the owner, never shot over them as a tenant would do. Even the witnesses on the other side agreed that this was an exceedingly good moor.

This concluded the proceedings. The award will be made on a future day.

It may be of interest to quote here, as showing the great diversity of opinion which exists among ironmasters, the various estimates as to the amount of compensation to which Mr. Garnett is entitled. When the case was before Mr. Bateman, the Corporation witnesses assessed the amount as follows:—Mr. J. Mansergh, C.E., £738 16s. 8d.; Mr. J. Newton, C.E., £497; Mr. T. Bennett, C.E., 1093 15s. At the present hearing the following preliminary remarks were made by the witnesses: Mr. Matthews, C.E., £19,800; Mr. T. Statter, £23,274; Mr. G. Storey, £23,274; Mr. J. Farrar, C.E., £16,035; Mr. J. Jackson, C.E., £16,035. Corporation witnesses: Mr. T. Gough, £1491 9s. 2d.; Mr. R. J. Dent, £1592 1s. 8d.; Mr. Addie, £732.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

So far as Manchester and the immediately surrounding district is concerned, a general advance in prices has been carried out to the extent of 10d. per ton on best coal, and 5d. on other descriptions of fuel except burgy; but this upward movement has only been followed out partially in the other districts. The general tone of the market is, however, towards more firmness, and any present hesitation in making further material advance in prices is due chiefly to the exceptional mildness of the weather, which has, of course, temporarily affected the requirements for general consumption, and it is not improbable that an upward movement in prices may be carried out during the month, especially in the district now going on will almost compel colliery proprietors to take some such course. The better classes of round coal are moving off pretty freely for the time of the year, although there is no actual pressure in the market. A good deal of gas coal is now going away on account of contracts, but this is not much more business than usual. On the other hand, there is moderate demand, and the pits are kept going about full time generally. The average prices at the pit's mouth are about as under:—Best Wigan Arley, 9s. to 9s. 6d.; Pemberton four-foot and lower qualities of Arley for best fire and for manufacturing, 7s. to 7d. 6d.; common Wigan mines, 6s. to 6s. 6d.; steam and forge coals, 5s. 6d. to 5s. 9d.; burgy, 4s. to 4s. 6d.; and good slack, 3s. to 3s. 6d. per ton.

There is a moderate inquiry for shipment, but for shipping orders colliery proprietors have to take lower prices than are obtainable for direct sales; steam coal delivered at Liverpool and Garston being still offered at 6s. 9d. to 7s. 3d. per ton.

For the last few days there has been rather a falling-off in the amount of business doing in the iron trade of this district, but local makers of pig iron, having sold pretty largely during the last two or three weeks, show very little anxiety to press for orders at present. A considerable weight of iron has been going into the hands of consumers in the district for delivery over the next three or four months, and prices for Lancashire pig iron are now firm at 45s. 6d. for No. 4 forge, and 47s. 6d. for No. 3 foundry, less 2s. per cent., delivered equal to Manchester. There has been only a dull demand for manufactured iron, and for local bars delivered into the Manchester district the average price is about £5 15s. per ton.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade generally continues good, recent advances being fully sustained. Although the rise is not equally general, it is sufficiently extended to be considered established, and no doubt if the demand continues, those coals which have not hitherto been able to secure

better figures will now do so. The necessity for replenishing stocks, and the delays which the inclement weather has caused to tonnage on the way either to load or discharge coal cargoes, have contributed to the advance, and there are those who maintain that we shall see a continuance of the improvement throughout the year of which the commencement is so near at hand. An additional 1s. per ton will do no harm, except to those who may have speculated at low prices. The Royal Mail Company's yearly consideration has been arranged. There was no open competition, but it is considered that the figures are, if anything, a little better than those which were given twelve months since. Patent fuel, both at Cardiff and Swansea, continues in good demand.

The tin-plate trade is generally in a languid state, but the New Western Mill, owing to the no man's land of tin bars at Cwmaman has re-started, and the men are again at full work. The proprietor has spent over £10,000 in this additional branch of business, and contemplates the erection of black-plate mills, to be followed by the manufacture of tin-plates.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The improvement in the local coal trade continues, and, on the whole, the business transactions of the past week have been of a satisfactory character. Orders are being placed in a plentiful and better class. Owing to the issuing of orders for winter stocks, a fair number of the collieries are well employed, and the order books are tolerably full. The masters are making fewer complaints, and the operatives have a prospect of a fair season's work, though the working scale is considered to be unevenly regulated. At the Walsingham and Wednesbury Collieries, the Colliery Owners' proprietors made quotations of from 10s. to 11s. per ton for deep, and 8s. 6d. for shallow at the pit's mouth, which is a further rise of 1s. per ton, making for the past month an increase of 2s. on deep and 6d. on shallow; the standard rates now being 1s. per ton over those of the corresponding period of last year. The proprietors of the Ellicott Colliery now have, by the amalgamation of that district with the Tipton, a prospect of renewing operations, as the work of pumping from those pits will be shortly commenced under the mines drainage scheme. As nearly the whole of the pits in the Bilston district have been idle so long, owing to their waterlogged condition, a step has definitely been made in the right direction. The Tipton colliery owners are, however, expressing dissatisfaction.

The iron trade is more animated, and smelters are hopeful of the future. The demand is steadily improving, and the markets are more numerously attended. Quotations are, in the main, unchanged for the past two weeks, but the finer qualities of iron are in anything, iron, in so far as best bars are concerned. Bars of second quality, as also sheets, plates, strip, and hoop iron, are more inquired for. Makers of pig are reported to have a fair stock of orders in hand. In this branch, there is a better call both for all-mine and part-mine, and cinder qualities are becoming the full quoted market. American market is not dead, there is a good average number of lines to hand for the Colonies. Ironstone and other minerals are selling better. Makers of heavy iron-foundry productions are steadily employed, and tube makers, galvanizers, and engineers are reporting an improvement on the month.

YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There has of late been a falling-off with respect to the demand for steam coal, owing to the no man's land of tin bars at Cwmaman, but on the whole, many of the leading thick-steam pits are forwarding about average supplies to Hull, Goole, and Grimsby. A good deal of interest has, during the past week, been attached to the tenders for the supply of steam and locomotive coal for the North-Eastern Railway Company, and which close on Thursday. Colliery owners are competing for the supply of steam coal for the Company during the ensuing year, and a meeting of the South Yorkshire Steam Coal Owners Association has been held to fix the prices.

At several of the collieries in the Barnsley, Sheffield, and Rotherham districts the raising of gas coal ranks amongst the leading features of the trade. The great demand for this kind of coal is being met by the local collieries, as well as to the Eastern Counties. Supplies are for the most part forwarded on account of contracts entered into during the early part of the year.

Small coal suitable for engine purposes is not over good to get rid of, although prices are not high. There is, however, a very large quantity now going on in connection with coke-making, which was scarcely over so largely followed as at the present time. As might be expected, business is not so active as it was a short time ago, whilst prices are rather lower. North Lincolnshire smelters draw largely from South Yorkshire, and send a return of good tonnage of ironstone for the use of the Yorkshire furnaces.

Great interest is just now being taken by both masters and men in the Employers' Liability Act, which comes into operation on the 1st of next month. All the secretaries of the various Yorkshire miners associations are urging the men to be at the meeting of the Act, which they hold as destined to serve something more than a mere moral consideration. The men are, however, largely interested in the West Yorkshire Miners' Permanent Relief Fund, which has over 9000 members, and is largely supported by the owners paying compensation, and steps are likely to be taken by the latter Society for the purpose of testing the feeling of the men on the iron trade.

The iron trade, taken as a whole, is only quiet. One of the most prosperous branches connected with the trade is that relating to the make of pig iron, which is now largely carried on in various parts of both South and West Yorkshire. The demand for cast and rolled material is not over largely pronounced. The foundries continue slack, and several are in the market for sale.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The Durham gas collieries are doing well. The shipments of coals and coke from the Tyne Dock over the past fortnight have been the largest of two weeks over a period of 20 years. The heaviest shipments have been gas coals, the price of which is unchanged. The contracts which will be made between this time and the end of January it is in every way probable will be at about the same figures as are now over the year—between 6s. and 7s. per ton, according to quality. The coke trade with the iron districts in Durham, Northumberland, North Yorkshire, Cumberland, and North Lancashire, is steady; and there have also been considerable shipments of coke to Spain and the Mediterranean over the last fortnight, and November, and December, of Durham, of which the prices are not changing; they keep at a moderate figure. Ordinary kinds of coal are in excellent demand. They are in a better position in the market than they have been over the past five winters. They have improved about 2s. a ton in value since September. Steam coals are doing a little better, but the bulk of the business is in the regular demand for small and manufacturing coals for local consumption at the factories and

the ironworks. There is no glut, neither is there speculation in any of the markets.

There has been a better supply of coasting sailing tonnage in the northern coal ports over the last fortnight, and the requirements of the gas-works have been fully met. A large number of cargoes of gas coals reached the bye-ports last week from the Tyne, and the trade has fallen into its regular track again. Freight paid small sailing vessels to load gas coals for the South are about the same to all the Channel and Eastern Counties ports. The freight paid steamers to carry coals to the London market is 4s. 6d. per ton. This is the regular figure at present. An improvement is noted in the shipment of gas coals to the North of France, and to the Italian ports of the Mediterranean. Steamers and sailing ships were also engaged last week on the Tyne to load cargoes of coals for the Irish gas-works; in fact, shipping business was very active all last week. There was a considerable supply of tonnage in the Tyne Dock put in turn to load gas coals coastwise. There have been considerable shipments of goods overseas.

The fire-brick and fire-clay retort business generally is dull, and most large concerns are adding to stock. The chemical markets, not only in the North but in Lancashire, are very flat. Prices do not improve, but, low as they are, in some instances they are less than they were a month ago. Stocks, fortunately, are kept down. The ironfoundries and rolling mills in the North of England are fully employed. There is a good deal of gas plant in the course of manufacture at Gateshead and Birtley.

THE PROPOSED AMALGAMATION OF THE BRIGHTON GAS COMPANIES.—The General Purposes Committee of the Brighton Town Council have resolved to oppose the intended application to Parliament of the Brighton and Hove Gas Company, for powers to purchase by agreement the undertakings of the Brighton Gaslight and Coke Company, the Aldington, Hove, and Brighton Gas Company.

THE WATER SUPPLY OF PEMBROKE.—A meeting of the Pembroke Town Council was held on the 25th ult.—the Mayor (Alderman George) in the chair—for the purpose of considering the question of providing water-works for the borough. Arrangements had, it was stated, some time since been made by private gentlemen to form a Company for carrying out a water-supply scheme, but without success. After a lengthy discussion, a resolution was passed that the Council should take the matter into their own hands, and ascertain the best way to provide the borough with water (a competent Engineer being engaged to ascertain where water could be obtained), and then make application to the Local Government Board for the money required to carry out the necessary works.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Dec. 1, 1880.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphurated Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company	Notting Hill	17.9	17.0	17.4	11.7	9.3	10.7	0.2	0.1	0.1	None.	In excess.
	Camden Town	17.2	16.4	16.9	20.8	15.8	17.6	0.0	0.0	0.0	"	"
	Dalston	17.3	16.8	17.0	14.4	11.5	13.2	0.4	0.0	0.1	"	"
	Bow	17.1	16.6	16.9	14.7	11.3	13.1	0.2	0.0	0.1	"	"
	Chelsea	17.0	16.5	16.7	19.7	14.8	16.9	0.2	0.0	0.1	"	"
	King's Road	17.2	16.5	16.9	14.8	11.4	13.0	0.0	0.0	0.0	"	"
South Metropolitan Gas Company	Westminster (cannel gas)	21.5	20.4	20.9	21.3	15.8	18.7	0.0	0.0	0.0	"	"
	Peckham	16.9	16.6	16.8	14.2	9.3	11.7	0.5	0.0	0.3	"	"
Commercial Gas Company	Old Ford	18.1	16.9	17.5	16.5	14.0	15.4	0.2	0.1	0.1	"	"
	St. George-in-the-East	17.6	16.2	17.1	18.3	7.3	11.9	0.1	0.0	0.0	"	"

(Signed) T. W. KRATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 15 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at 30 in. static and 23 grains in the 100 cubic feet of gas at 28 in. static, and not to exceed 4 grains in the 100 cubic feet of gas. Sulphurated hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

Share List of Gas and Water Companies.

Number of Shares Issued.	NAME.	Amount paid up per Share.	Last Div. p. Cent. p. Ann.	Latest Quotations.	Number of Shares Issued.	NAME.	Amount paid up per Share.	Last Div. p. Cent. p. Ann.	Latest Quotations.
58904	Gas Companies.	£ 5 s. d.	£ 5 s. d.	£ 5 s. d.	6200	Gas Companies.	£ 5 s. d.	£ 5 s. d.	£ 5 s. d.
10000	Alliance and Dublin	20 0 0	0 0	17-17½	30000	Georgetown, Guinea	5 0 0	7 0 0	41-47
5000	Anglo-Romano	20 0 0	0 0	21-23	115000	Glasgow Corporation	100 0 0	0 0	208-210
1000	Bahia (Limited).	20 0 0	0 0	16-17	100	Glasgow Gas	100 0 0	6 15	155-160
1000	Do, 1st pref.	20 0 0	0 0	25-27	100	Grimsby Gas	100 0 0	0 0	284
1500	Do, 2nd pref.	20 0 0	0 0	10-11	100	Hampton Court	10 0 0	0 0	15-16
40000	5 Bombay (Limited).	5 0 0	7 0	52-61	7000	Hong Kong (Limited)	10 0 0	0 0	15-16
10000	Do, fourth issue.	4 0 0	7 0	9-11pm.	30000	Imperial Continental	10 0 0	10p.c.	187-190
10000	Bournemouth	10 0 0	8 0	13-14½	5000	Do, 1st pref.	20 0 0	6 0	31-33
225700	Brentford	100 0 0	9 0	93-100	26000	Do, 2nd pref.	20 0 0	6 0	31-33
..	Do, 5 per cent. pref.	100 0 0	5 0	95-100	..	Do, Debenture	100 0 0	5 s. 6d.	..
..	Do, 10 shares	18 0 0	9 0	6-6 3/4m.	..	Do, 10 shares	2100	5	..
5100	Brighton	20 0 0	0 0	36-38	..	Do, 10 shares	2100	5	..
5000	Brighton and Hove	20 0 0	0 0	34-36	..	Do, 10 shares	2100	5	..
14000	British (Limited).	20 0 0	0 0	32-33	56100	Do, 10 shares	2100	5	..
7282	Capitani (Limited).	20 0 0	0 0	19	155000	Do, 10 shares	2100	5	..
1500	Colney Hatch	10 0 0	5 0	9-11	26000	Do, 10 shares	2100	5	..
30000	Commercial	100 0 0	11 0	93-138	26000	Do, 10 shares	2100	5	..
70000	Do, 7 per cent.	100 0 0	8 0	93-142	26000	Do, 10 shares	2100	5	..
20000	Continental Union	20 0 0	6 0	21½-22	15000	Do, 10 shares	2100	5	..
23000	Do, new	20 0 0	6 0	21½-22	20000	Do, 10 shares	2100	5	..
20000	Do, 10 shares	20 0 0	7 0	24-24½	6000	Do, 10 shares	2100	5	..
15000	Crystal Palace	100 0 0	10 0	172-177	20000	Do, 10 shares	2100	5	..
121000	Do, 7 per cent.	100 0 0	7 0	138-139	30000	Do, 10 shares	2100	5	..
50000	Do, preference	100 0 0	6 0	119-123	10000	Do, 10 shares	2100	5	..
25000	Do, ordin. 7 p. e.	1 4 0	7 0	138-139	30000	Do, 10 shares	2100	5	..
35400	Edinburgh	20 0 0	5 0	16-18	30000	Do, 10 shares	2100	5	..
23400	European (Limited)	10 0 0	10 0	19-20	30000	Do, 10 shares	2100	5	..
12000	Do, new shares.	7 10 0	10 0	63-71	10000	Do, 10 shares	2100	5	..
50000	Do, F 5 do. do.	10 0 0	5 0	108-111	20000	Do, 10 shares	2100	5	..
4096300	Gaslight & Coke A.	100 0 0	11 0	181-183	3000	Do, 10 shares	2100	5	..
100000	Do, B.	100 0 0	4 0	75-78	3000	Do, 10 shares	2100	5	..
50000	Do, C.	100 0 0	5 0	117-121	37500	Do, 10 shares	2100	5	..
20000	Do, C 10 p. cent. pref.	100 0 0	10 0	217-222	15000	Do, 10 shares	2100	5	..
30000	Do, D do. do.	100 0 0	10 0	217-222	15000	Do, 10 shares	2100	5	..
150000	Do, E do. do.	100 0 0	10 0	217-222	15000	Do, 10 shares	2100	5	..
20000	Do, F 5 do. do.	100 0 0	5 0	108-111	20000	Do, 10 shares	2100	5	..
60000	Do, G 7½ do. do.	100 0 0	7 0	100-103	12500	Do, 10 shares	2100	5	..
1300000	Do, H	100 0 0	7 0	136-139	3000	Do, 10 shares	2100	5	..

THE SHEFFIELD WATER COMPANY AND THE BATHS QUESTION.—In reference to the statement contained in a paragraph in the last number of the JOURNAL, given on the authority of the *Sheffield Independent*, that an appeal would be made by the Water Consumers Defence Association against the decision of the Master of the Rolls in regard to the supply of water to baths, the same authority now says that the wisdom of prosecuting an appeal by no means commends itself to all the subscribers to the Bingham defence fund, some of whom would prefer to take advantage of the possibilities opened up by clause 3 of the parliamentary notice issued by the Company for a Bill next session, rather than fight the battle in the law courts. Under this clause the Company ask for power to supply water by agreement for all or any of the purposes mentioned in section 81 of the Sheffield Water-Works Act, 1853; but should the appeal go on, this clause might perchance not be inserted in the Bill. It has been reported that the Company were collecting the bath rates under the authority of the notice; but it appears that there is no truth in the report.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 4938.—WYMAN, W., Southgate Street, Gloucester, "A gas-stove for heating and ventilating purposes." Nov. 27, 1880.
4944.—SMITH, S., Croydon, Surrey, "Improvements in gas-stoves or heating apparatus by agreement for all or any of the purposes mentioned in section 81 of the Sheffield Water-Works Act, 1853; but should the appeal go on, this clause might perchance not be inserted in the Bill. It has been reported that the Company were collecting the bath rates under the authority of the notice; but it appears that there is no truth in the report."
4951.—STEVES, W. J. B., Stepney, London, "Improvements in apparatus for the manufacture and purification of gas." Dec. 1, 1880.
5014.—SWAN, J. W., Newcastle-upon-Tyne, "Improvements in and connected with electric lamps." Dec. 2, 1880.
5024.—HOBBS, E. W., and TWEDDALL, E. and S., Accrington, Lancs., "Improvements in gas-engines." Dec. 2, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 2260.—MORR, W. W., Bournemouth, Hampshire, "Improvements in apparatus used in the manufacture of gas." June 3, 1880.
2265.—WILLIAMS, M., Wigan, Lancs., "Improvements in methods of and apparatus for increasing the illuminating power of gas-flames." June 3, 1880.
2288.—ROBINSON, J., Uxbridge Road, London, "An improved joint for water and other pipes." June 5, 1880.

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TO CORRESPONDENTS.

J. W. & Co.—Your letter arrived too late for insertion in to-day's JOURNAL. It will appear next week. Shall be glad if next time you communicate you use one side only of the paper.

RECEIVED.—Vol. III. of "A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali, with Collateral Branches." By George Lunge, Ph.D., F.C.S., &c. London: J. Van Voorst. 1880.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 14, 1880.

Circular to Gas Companies.

As the time approaches when the Employers Liability Act will come into operation, signs multiply to show that masters and men are painfully feeling their way in anticipation of its probable effects. Nobody seems to know exactly what changes may be expected in industrial organizations when the new law becomes an obtrusive fact; and in all probability it will be some time before either employers or workmen perfectly realize the value of their fresh responsibilities or privileges. To this uncertainty must be ascribed the tentative character of much of the proposed action in contemplation of the impending alteration in industrial politics. Fortunately, we are not directly concerned with any of the more burning questions respecting the operation of the Act, such, for example, as are even now agitating the minds of railway operatives and miners. There is a strong feeling on the part of these classes of the labouring population, among whom the victims of accident are known to be many, against the Act being construed merely as a measure for providing pecuniary compensation for personal injury to servants. They consider that any arrangement whereby their employers can insure themselves against mere loss of money caused by accidents to workmen is in contravention of the spirit of the Act, which they contend was meant to render accidents less frequent, by fining the employer heavily for their occurrence. From this point of view it is evident that financial operations, by way of a general insurance, based on actuarial calculations of the past recurrence of injury to persons employed in any particular occupation, are distinctly open to the imputation of tending to perpetuate a state of things which might be ameliorated, if those most concerned in controlling the conditions under which accidents happen were made personally responsible for them. On the other hand, there is nothing in the Act to forbid employers taking advantage of formal insurance, either on their own account or in concert with others; and there can be no doubt that action of this kind would help

to make the workman's compensation more secure. It is also conceivable that litigation would be diminished by the matter, in case of dispute, being practically made referable to a third party; although this is a phase of the difficulty to be expected in the practical working of the law, which is almost too debatable for the very vaguest prognostications.

As we have said, however, considerations of this kind, which almost presuppose a daily toil attended by great risk, together with a total severance of the interests of employers and employed, are somewhat foreign to us. Gas-works are not hazardous places of employment. It would be difficult to name an occupation wherein more workmen grow to a hard old age than in the manufacture of gas. The labour in most departments of a gas undertaking, though moderately severe, in the sense of requiring sound, able-bodied men for its performance, is neither dangerous to life or limb nor exhaustive of vital power. Many men pass their working years in the service of a Gas Company, even in the retort-house, with no more damage than a burnt hand or a gathered finger, while in other branches they are rarely subject to more than the casual injuries common to outdoor workmen on the ground. And it cannot be said that the general relations of the men with their employers are such as to cause much fear that the law will form a bone of contention between the two parties. In all cases it will probably be easy to arrive at a *modus vivendi* for the prevention of any possible unpleasantness which may arise when masters and men undertake to work separately under the Act, instead of together. In large establishments particularly it will be comparatively simple to combine the employers' insurance with the workmen's provident club. There is, of course, nothing to compel the workman, in case of injury, to go upon the club instead of proceeding against his employer; but he would be unable, in any case, to claim from both, and the fact that belonging to the club is generally one of the conditions of employment, with the further consideration that claiming from the club funds would be less troublesome and more profitable in many ways than the more belligerent course, would keep the employer practically safe.

The immunities of Gas Companies servants from personal injury is strikingly shown by the history of the Superannuation and Sick Fund established in 1855 by the South Metropolitan Gas Company, for the benefit of their workmen. From the period of its commencement until the close of last year when a general inquiry into the working of the fund was instituted, not a single case has occurred of a subscriber, in the execution of his duty, receiving such injury as to render him incapable of work, and thereby throw him on the benefit of the fund. This fund is otherwise remarkable. The subscription is threepence weekly, entitling the subscriber to a pension of ten shillings per week when past work. The Company have contributed to the fund, roughly speaking, about as much as the members have paid, and, as a result, the fund has at least thirty per cent. of assets in excess of all contingent and emergent liabilities. The gross amount of the Company's contribution has never exceeded £200 per annum, so that the declining years of their old hands have been made comfortable at a small cost over and above the money collected from the men themselves.

Although, in the past, this particular Company would have escaped all liability under any penal Act of the nature of that under notice, for the all-sufficient reason that there have been no injuries, it is plain that it would be imprudent even for them to expect a continuance of their fortunate experience. Therefore the old superannuation fund will be remodelled, and made the basis of the new insurance fund. It is satisfactory to be assured that even the extreme amounts by way of compensation mentioned in the Act, will be amply covered by a premium on a very small scale. When threepence per week per head is found, in one example, an ample subsidy for meeting all the charges for workmen's pensions and allowances, the burden of an additional and separate accident fund must surely be small.

And must surely have overlooked the fact in all cases it is essential that employers and employed should combine to make the best of the inevitable. Only in this way can the operation of the Act be made beneficial or even unobjectionable. A policy for employers which consists in holding aloof, or attempting to terrorize workmen from availing themselves of the Act, will most assuredly fail to shield those who adopt it from loss of money and repute, while it will furnish a strong argument for the use of agitators in demanding a measure more stringent still.

The gas supply of Stone, Staffordshire, appears destined to force itself upon public notice. The present state of

affairs in that locality is not considered satisfactory by the inhabitants, for reasons not altogether due to the action of the local Gas Company. The Company are applying to the Board of Trade for a Provisional Order, by which they hope to strengthen their position, and among other conditions to be included in the Order, they seek to obtain a maximum price for gas a trifle higher than that actually charged at present. This is only common prudence, but it nevertheless alarms the consumers, who somehow do not see that the maximum legal charge and the ordinary price fixed by commercial considerations are two distinct things. The chief cause of public disquietude is, however, the late and present policy of the Local Board. Last year the Board made application to the Local Government Board for authority to erect works and supply gas in competition with the Company. The application was not successful; but heavy expenses, amounting to a rate of about 1s. 6d. in the pound, were incurred, and this charge swells the town rate now payable to such an abnormal figure, that a local Hampden has arisen, in the person of Mr. Martin Smith, the General Manager of the North Staffordshire Railway Company, who flatly declines to pay anything to the Board, on the ground that the cost of the gas agitation was incurred without the consent of the ratepayers, and was consequently without legal sanction. This gentleman is decidedly the hero of the hour in his own neighbourhood, and his defiance of the constituted authorities is rapturously applauded by the majority of the inhabitants of Stone, who are naturally not averse to having the common cause defended by any one who is imbued with sufficient public spirit to fight the Board at his own expense. Mr. Smith also proposes to carry the war into the enemy's country by commencing negotiations with the Company on behalf of the consumers, independently of the Board, in the belief that the ground will be cut from under those oppressors of the poor (ratepayers) by the demonstration that better terms may be made with the Company, without incurring any expense, than the Board can claim to have effected at a perfectly ruinous cost. We wish the enterprising railway manager every success in his last-named efforts, for he will at least have an instructive interview with the Directors of the Company, and may become satisfied that they do not seek more extensive powers than are enjoyed by the majority of Gas Companies in the kingdom. We shall, moreover, await with interest the result of Mr. Smith's personal struggle with the Board on the great rate question.

The Bristol Sanitary Authority have a very curious way of doing business. Being dissatisfied with the tenders submitted by the Gas Company for lighting the public lamps, they recently decided to ask the Directors to reduce the price, and if they were unsuccessful, to refer the matter to arbitration. So far well; the Authority are justified in seeking to obtain the best terms possible; and, if a clear case can be made out for the necessity for arbitration, it is both the lawful and sensible course to be taken. But probably with the intention of frightening the Company into submission to any terms, the Sub-Committee on Lighting persuaded the Authority at a recent meeting to sanction the expenditure of £500 in experiments in electric lighting. How much electric lighting the Committee expect to get for this sum does not transpire, nor does the proportion borne by the same amount to the cost of the gas supplied to the public lamps. The Quay was suggested as a suitable scene for the proposed experiments; but again we fail to see how taking from the Gas Company such a portion of this particular area as may be lighted by electricity for £500, will tend to make the latter charge less for lighting the tortuous streets and alleys of the rest of the old city. When gas has reason to fear electricity in the illumination of such places as Bristol, the game will be almost over; but at present the picturesque though tangled plan of the place decidedly favours the Gas Company.

The Town Council of Newport (Isle of Wight) are so dissatisfied with the working of the average meter system for street lighting, of which they have had a few years experience, that they have decided to discontinue it for the ensuing year, and have offered to make a contract with the Gas Company at fixed rates, by which they will, they anticipate, save 8s. 8d. per lamp per annum, as compared with the cost of the present mode of lighting. Whether the Company will accept the offer remains to be seen; but if the Council were satisfied that, under the average meter system, they only paid for the gas actually consumed, the burden of proving the necessity of reduction lies with them. If the price of gas was too high, the Council might have asked the Company to lower

their rate; but to throw over an arrangement of which so much was expected, and thereupon to ask for the same light at a less cost without assigning cogent reasons for such a change of plan, is a rather inexplicable proceeding.

The officials of the Alliance and Dublin Consumers Gas Company and of the Dublin Tramways Company have achieved a practical success for their plans for lighting tram cars with gas of the ordinary kind as supplied to the city. The gas, compressed at starting, is contained in reservoirs (situated underneath the seats in the cars) of sufficient capacity to serve for a double journey. It has been shown that cars so lighted are much more cheerful and comfortable than when lit by oil in the old way. All the Dublin tram cars are, it is said, to be immediately fitted for the new method of lighting, and when this is done the condition of night travellers therein will be considerably ameliorated. It is difficult to see that any greatly increased consumption of gas will be experienced by the Company in consequence of this novel development of business, but they are to be popularize the use of gas.

The paper on gas-retorts read by Mr. J. Chadwick before the Manchester District Institution of Gas Engineers at their last meeting, and printed in another column, was principally concerned with the comparative merits of brick-built and moulded clay retorts. The subsequent protracted discussion was also confined in the greater part to the same question. It cannot be said that anything very new transpired on this occasion, for nothing was exemplified by the remarks of the various speakers more than the power of custom. The majority of the advocates of brick or moulded retorts, if not exactly "born so," were still, from the persistence with which the kind of retort best and longest known to each speaker was by him considered to be the absolute superior, so wedded thereto, that it almost looked as if a man experienced in the use of one kind could not bring himself to see much good in any other. To do the determined adherents of the two forms of fire-clay retorts justice, it may, however, be conceded that the difference between them is mainly one of practice only.

Mr. Walker's paper subsequently read was in its essence a plea for the tower scrubber, and was spirited and well-timed. The author was supported by all of his hearers, for there did not appear to be a friend of any other kind of scrubber present, although the discussion wandered a little in the direction of washers, for it is sometimes difficult to distinguish between the two classes of apparatus. Mr. Walker is a believer in the policy of utilizing ammoniacal liquor as a purifying agent, which is quite a separate business from the mere elimination of the ammonia from gas. He appears to have attained much success in this direction, for which, according to him, the tower form of scrubber is best suited.

PURCHASE OF THE NEWTOWARDS GAS-WORKS BY THE TOWN COMMISSIONERS.—It may be remembered that in October last we gave some particulars of the negotiations that had been entered into between the Newtownards Town Commissioners and the local Gas Company for the purchase by the former of the Company's works and plant. We understand that the Commissioners have made an offer, which the Company have accepted, to take over the undertaking at the exact sum at which Mr. A. Silverthorne, who has throughout acted for the Commissioners, valued it—viz., £9886 10s., and which is £4877 less than the amount of Mr. G. Anderson's valuation on the part of the Company. The Commissioners now propose to borrow £10,000 to enable them to complete the purchase. It is gratifying that the consideration shown by both parties to Mr. Silverthorne's valuation will save the expense of an arbitration.

THE GAS SUPPLY OF STONE.—A public meeting was held at Stone last Wednesday, with reference to the question of the supply of gas there, and, as the notice convening the meeting stated, "to consider the powers proposed to be taken by the Gas Company, and to adopt such course as might be deemed advisable in the interests of the town." After some discussion, in the course of which it became very evident that the members of the Town Council had lost much of the confidence placed in them when elected, the following resolution was passed by acclamation, and a Committee of eight gentlemen appointed to carry it into effect:—"That a Committee of ratepayers and gas consumers be appointed by this meeting to examine the proposed Provisional Order of the Gas Company; to meet the Directors of the Company; and to endeavour to obtain, by friendly arrangement, such modifications in the scheme as they may consider desirable or necessary, in the interests of the town." **BIRMINGHAM CORPORATION GAS SUPPLY.**—At the meeting of the Birkenhead Town Council on Wednesday last—the Mayor (Mr. W. Laird) in the chair—the minutes of the Gas and Water Committee were brought up. They included a lengthy report from Mr. T. O. Paterson, the Corporation Gas Engineer, on the present condition of the gas-works, and on the extensions desirable to be made in them. On Mr. Hawcliffe moving the confirmation of the minutes, Alderman Willmer moved an amendment proposing the postponement of the adoption of the report, and the reference of the plans of the extensions contemplated to some eminent engineer for his opinion. Mr. Wilkinson seconded the amendment, which Mr. Hawcliffe characterized as frivolous, urging that delay in the matter would deprive a part of the town of its gas during the ensuing winter. On a vote being taken, the amendment was negatived by 40 votes against 4. The proceedings of the Committee were then confirmed.

Water and Sanitary Notes.

We have reason to believe that Sir William Harcourt is busily engaged in preparing his London Water Supply Bill for the coming session. From what we observe, we are inclined to think there is not much prospect of that "direct representation" for which Mr. J. Béal and his friends have so strong a predilection. In respect to the measure generally, we may give the Home Secretary credit for a certain amount of receptiveness, but no harm would accrue to the practical nature of the coming Bill if the Home Office would condescend to receive a little light from the Water Companies themselves.

Mr. F. H. Fowler has been making certain remarks at a recent meeting of the Strand District Board of Works, which serve to show that he has some appreciation of the magnitude of the task which would devolve on any new authority constituted to take charge of the Water Supply of the Metropolis. To be responsible for the supply to each one of six hundred thousand houses, including a population of four and a half millions, and to supervise the whole army of officials connected with the enterprise, is something more than Mr. Fowler thinks could be properly undertaken by a single administrative body. He favours, therefore, the idea of a new Regulation Act, forgetful, perhaps, in some degree, that one already exists, and that the Metropolitan Board of Works, of which body he is a member, is, to a large extent, responsible for the fact that in some points the law does so very little good. It is accordingly a question whether a new Regulation Act is really wanted and, if wanted, whether there is any authority—except it be the Local Government Board—who will co-operate with the Water Companies in carrying it out. Mr. Fowler has an idea of a change in the mode of charging for the water supply. He thinks it would be well that there should be a general rate for public purposes, and a domestic rate for houses, while all beyond (such as baths and business requirements, now charged for specially) should be paid for by meter. With regard to the domestic rate, he proposes that it should be graduated, so as to fall less heavily on small property. But we scarcely think Mr. Fowler will be able to devise any practicable scheme which will make the water-rate fall more lightly on small property than it does now. We believe it is just in this particular that the present system offers peculiarly easy terms. If the pressure falls anywhere, it is on the larger class of property, and especially on warehouses. As a matter of fact, the wealthy classes are made to pay for their water supply on the principle that it is part of a great sanitary system, in which the payment is not necessarily proportioned to the immediate personal advantage. If the mode of charging for the water supply undergoes any extensive change, we shall expect to find small property more heavily weighted, to the relief of those classes who can better afford to pay, and who at present contribute to the cost of the water supply after the same manner as they pay for sewerage and drainage. For the sake of the general good, water should be made as free as possible to the poorer classes, and this is the plan which now prevails in London.

In harmony with the remarks of Mr. F. H. Fowler at the Strand District Board, we observe that the Select Committee of the Lambeth Vestry who have taken the Water Question into their consideration, have prepared a report to be laid before the Vestry on Thursday next, proposing that the Companies should be placed "under improved regulations, with greater control on the part of the local authorities." There is notice of an amendment—"That no legislation will secure public confidence, and be satisfactory to the water consumers, unless it secures a representative water authority based on the direct representation of the ratepayers." Of course the equity of all this depends very much on what we are to understand by "improved regulations," and what are the powers to be possessed by the "water authority." Power given to the Vestries or anybody else to do as they please with property belonging to other parties, would be subversive of private rights, and would simply be confiscation in another form. Setting up a "standard of quality," as proposed by Lieut.-Col. Bolton, might be a very good regulation, and there might be some useful amendments in other respects. But "local authorities" and parochial politicians need not expect that Parliament will make them omnipotent over the Water Companies. At the same time the idea of regulation instead of purchase or competition shows a more reasonable spirit than has occasionally been manifested.

The speech of Alderman Knight, the Chairman of the Southwark and Vauxhall Water Company, at the half-yearly meeting of Shareholders, on Thursday last, contained some very pregnant facts. Another instance is afforded of the

accuracy of the statements put before Sir W. Harcourt's Select Committee by the late Mr. E. J. Smith. Where this much-abused gentleman reckoned on an increase of £3500 in the Company's income, the actual increase has exceeded £4000. The heavy law and parliamentary expenses forced upon the Company in connection with the question of the Metropolitan Water Supply last session has perceptibly operated in reduction of dividend, so far damaging the Company without benefit to the public. In consequence of the Government proceedings, the Company's own Bill had to be abandoned, involving a loss of £1478. In addition, the Company had to defend their own interests before the Select Committee, the outlay on that account amounting to £1024. Expenses were also incurred in opposing the proposed sewage farm of the Lower Thames Valley Main Sewerage Board. Altogether the law and parliamentary expenses were £2780 in the last, and £2763 in the previous half year, thus making a total of nearly £6000, or about one per cent. on the ordinary stock. The extent to which the parishes seek to raise the Company's assessment was also referred to by the Chairman as a heavy drawback. But for the law expenses, the Shareholders would now be receiving nine instead of seven and a half per cent.; and but for the increase in their assessment, they could have as much as ten per cent. next year, whereby, the limit of dividend being reached, the Company could direct their attention to a reduction in the water-rates. Despite all difficulties, the Company are in a prosperous condition, and the Chairman, in reference to the fate of the provisional agreement made with Sir R. Cross, is warranted in saying "the public have yet to learn" and to regret the bargain they have lost."

The half-yearly report of the Directors of the Grand Junction Water-Works Company, to be laid before the meeting of Shareholders to-morrow, calls attention to the "altered state of things" which has arisen since the negotiations for the purchase of their works were broken off. When those negotiations were commenced, the Company were burdened with a recent outlay of £124,000, incurred in the construction of important new works, from which they had received but little benefit. The tide has now turned, and whereas the annual increase of profit calculated upon by Mr. E. J. Smith was £5250, the actual increase for the last financial year proves to be £7553. The Directors further state they have thought the present "a fitting time" to urge strenuously, and as far as possible to enforce, in all new building districts and estates, the adoption of the constant supply, and arrangements have been made for carrying out this system forthwith in respect to several building estates now in course of development, of which a list is given. We may, therefore, hope that one well-worn sentence will speedily disappear from Lieut.-Col. Bolton's monthly report, which has told us from time to time that "all the Companies are moving in the matter, and giving constant supply under the Metropolis Water Act, 1871, in a portion of their districts, except the Grand Junction Company." A dividend at the rate of seven and a half per cent. is to be proposed at the meeting; but a little more might have been paid had it not been for those law and parliamentary charges which have arisen out of the recent agitation on the question of purchase.

ABOLITION OF METER-RENTS AT GUILDFORD.—The Secretary of the Guildford Gaslight and Coke Company (Mr. W. Longworth) has given notice to the consumers, on behalf of the Directors, that, on and from Sept. 30 last, and until further notice, meter-rents will be discontinued, and meters be supplied to consumers free of any charge for hire. It is further stated that consumers who heretofore have purchased meters from the Company, may, by arrangement, re-sell them.

SALES OF GAS AND WATER SHARES.—On Wednesday, the 1st inst., Mr. J. Banks sold by auction, at Polkstone, 14 £10 shares in the Polkstone Water Company; ten of them fetching £19 15s. per share, and four £19 10s. per share.—On Thursday, the 2nd inst., Mr. J. G. Sharp offered for sale by auction, at Bradford, some shares in the Clayton, Alerton, and Thornton Gas Company. 39 original £10 shares, all paid up, were sold for £18 10s. per share; 32 "A" shares of £10, fully paid up, realized £15 10s. per share; and 15 "B" shares of £10 (£5 each paid up) were knocked down at £8 5s. per share.—On Wednesday last, Messrs. Fox and Bonfield offered for sale at the Auction Mart, Tokenhouse Yard, E.C., 170 fully paid £10 shares in the Danish Gas Company. The Company was formed in 1854 to supply the principal cities and towns of Denmark with gas, for which purpose it has secured concessions. Works have been constructed in many of the most important towns, and the consumption annually increases. The capital of the Company is £150,000, in 15,000 shares of £10 each, and the dividend has been at the rate of 8 per cent. for the past ten years. The shares were put up in 17 lots, and were all sold at a premium of 6s. per share, the total amount realized being £1742 10s.—Last Tuesday some shares in the Rochester, Chatham, and Strood Gas Company were sold by auction at the following prices:—Fifty 40 "A" shares for £870, and 56 "B" shares for £628, these realizing rather more than £17 18s. each.—On Wednesday, shares in the Newport (Mon.) Water-Works Company were sold in lots of five each at the following prices:—£20 7s. 6d., £20 15s., £20 15s. 6d., £20 17s. 6d. (two lots), and £21. Two £10 preference shares in the same Company—6 per cent. dividend—sold for £16 each.

THE ENCOURAGEMENT OF GAS CONSUMPTION.

ALTHOUGH gas manufacturers have always regarded a large yearly increase in the quantity of gas sold as a proof of the vitality of their business, and such increase invariably suggests congratulations to those who enjoy it, yet it is doubtful whether, until very recent days, more than a small minority have used any special efforts to secure it. The sale of good gas at the lowest price consistent with fair dividends has usually resulted in growth sufficient to satisfy the producers, and the attraction to proprietors of increasing a good investment by subscribing capital for extensions has not been sufficient to provoke novel or definite exertion. Works have generally been laid down with not too large a margin of producing power, and when they are really profitably employed it is not unusual to find some reluctance to expend further considerable sums which may for a time be relatively less remunerative. To "let well alone" is the sentiment governing such cases. Without staying to inquire further why Gas Companies in the past have done little to foster and develop the uses and applications of gas, we may direct attention to two or three reasons of comparatively modern origin which have already had an influence in creating a more enterprising spirit, and which should prove a still stronger impulse in the same direction.

The first of these arises from the gradual transfer of the undertakings of Gas Companies to municipal bodies. To so large an extent has this change obtained, that the policy pursued by Corporation Gas Committees must, and does now greatly influence that of Companies, instead of being, as until very lately, simply matter for more or less friendly criticism. Now, in the case of a Corporation acquiring the business of a prosperous and well-conducted Gas Company—and the great majority of those hitherto transferred have been of this character—the hope of gain by the transaction is based almost entirely upon the anticipated increase of business to be done. The annual charge against the undertaking for interest on the purchase-money is usually fully equal to that required for the payment of the maximum dividends of the Company purchased. The greater economy with which the Corporation can raise money, as compared with the Company, only enables it to pay the necessary premium, and start at no disadvantage on this head, despite the large increase in the nominal amount of capital employed. Allowing to the Company that it has honestly observed the conditions of the Acts by which it was regulated, no profit beyond that necessary for the payment of dividends has been earned, or, if earned, it has been returned to the consumers in the form of a reduction in the price of gas. Again, it is manifestly unsafe to build much upon the chances of still greater economy in production, especially in these times of exceptionally low prices of all the principal materials used in gas manufacture. An increase in the price of gas for the mere purpose of creating a balance of profit, is, of course, out of the question. We repeat, therefore, that the only legitimate hope of gain to a Corporation acquiring the business of a well-managed Gas Company lies in the certainty that the business will increase, and the gain should be proportionate to such increase. Clearly, if this be so, there is imparted to a very large and steadily increasing proportion of the gas undertakings of the country a great stimulus not felt before, and the influence of which will extend beyond its own wide borders.

Another reason for the increased activity that has become apparent is one which it may be anticipated will long continue its beneficent operation. The electric light has imported into the domain of gas makers the novel and stimulating idea of rivalry. No doubt, gasmen generally are sincere in the conviction they express that this rivalry is not a serious one in the sense of threatening a displacement to any large extent of gaslight by electricity. No one, however, denies that the competition is very real on the points of efficiency and attractiveness in many situations. The electric light has also created a desire for illumination more brilliant than that hitherto generally accepted as satisfactory, and there has been a considerable and praiseworthy effort made to prove that gas is capable of meeting the new requirements. We recently described the superb display of the capabilities of gas for illuminating large spaces designed for the Corporation of Birmingham by Mr. Hant. This exposition—in many respects the most successful of its kind—is one of a number which, inaugurated in London two years ago by the late Phoenix Company, aided by Mr. Sugg, have since that time brightened the "after-dark" appearance of every considerable town in the kingdom. We need not remind our readers that the contest for supremacy in this territory is still to be fought out, and no sense of security as to the issue

should be allowed to diminish its thoroughness. Gas should be enabled to win by its own merits, rather than by trusting to the supposed inherent defects of its rival. A sad example of "how not to do" this is afforded constantly to the large numbers of observant and interested persons who visit the electric lights on the Thames Embankment and Waterloo Bridge. The gas lights in these thoroughfares are probably the worst of their kind in London. Waterloo Bridge especially has for years past been given over to the most wretched burlesque of gas lighting ever witnessed in public. The comparison between a flame consuming from four to six feet of gas per hour, and an electric light of, say, a hundred candles, is sufficiently trying to the former at its best; but only those who have seen it can realize how painful it is when the gas is at, not its worst, but the worst of bad burners and dirty lamps. Amid general signs of a desire to improve upon the work of the past, these blots are probably useful as pointing one direction in which advance should be made. It may be reasonably hoped that having served as examples of inefficiency for so long, these lamps may soon be reformed from their bad pre-eminence to fair examples of efficient lighting. The illustration we have used is, no doubt, exceptional; but it has been named because we regard it as not only unwise but unfair to gaslight that it should be so unnecessarily disparaged. Generally there is an evident determination to pursue an opposite policy, and this is the reason why we hail the sentiment of rivalry which has arisen, and from it anticipate increasing advantage to gas industry.

Another inducement to a policy of enterprise and a desire for growth, we need hardly say, has been furnished by the abolition of a fixed maximum dividend, and the substitution of the sliding scale. This modern revolution in gas legislation has proved, and must increasingly prove a strong stimulus in the desired direction, and to this extent, at least, it has our cordial approval. As with Corporations under the conditions we have described, so with Companies working under the sliding scale, and having a normal price which is not favourable, but simply just, this advantage will be found: The increased dividend hoped for will be obtained more surely from enlarged operations and increased sale than from any other source.

These, then, are some of the special reasons which are acting at the present time to excite a greater interest in the development of the uses of gas. They are added and supplemental to the desire which has always prevailed among those who are proud of their manufacture to see it have as wide a scope as possible, and from the number and diversity of the causes thus operating much may be expected. We shall return to this subject in our next issue, and point out some of the directions in which the development may be hastened, as well as the advantages which will be reaped from it.

The annual dinner of the members of the Society of Engineers will take place to-morrow (Wednesday) evening at the Guildhall Tavern, Gresham Street, E.C., at six o'clock precisely.

SOCIETY OF ENGINEERS.—At the meeting of the Society of Engineers on Monday, the 6th inst.—Mr. J. Bernays in the chair—a paper was read by Mr. Frank W. Grierson, Mem. Physical Society (London), &c., on "The National Value of Cheap Patents," in which he showed that the stamp duties on a patent in this country, lasting 14 years, are £175, while those on an American patent, lasting 17 years, are only £7. A table was given of the applications and grants of the British and American Patent Offices during the last ten years, from which it could be seen that our 450 stamp duty at the third year kills 70 per cent. of the patents granted, and that our £100 duty at the seventh year kills 90 per cent. more, leaving only 10 or 11 per cent. to complete the full term. The effect of these duties is that while on Dec. 31, 1879, there were in this country only 15,755 patents in force, in the United States there were more than 200,000, not including designs. The States thus have thirteen times more patents in force than we have, and therefore make thirteen efforts towards advancement for every one that we make. During the last ten years 23,868 British patents have been crushed out by these duties, but an American patent once granted lasts the full term without further payment. The result of this is seen in our enormous import of American goods, and in the continuous flow of our skilled artisans to America. From a comparative table of average results for the last ten years it was seen that the applications for patents in the United States and Great Britain respectively are 19,770 and 4490, and the grants are 13,355 and 2980. The average cost, to the inventor, for one patent, including patent agent's charges, is there only £19, but here £190. Only one patent is granted in this country to three that are granted in the States, after allowing for the difference in population; and the duties on one patent here would pay those on twenty-five there. It might therefore be fairly said that the British inventor is handicapped 25 to 1 in favour of the American, and it is to be remembered that in handicapping the inventor we handicap the nation. Mr. Grierson drew attention to Mr. Stansfeld's proposed reduced stamp duties—viz., on application, £2; on complete specification, £3—total, £5; besides an annual tax of £1. Provisional protection to be for one year, and patents to last 21 years. After remarking upon the advantage of official technical examination of applications, the author pointed out that it is impossible to calculate the enormous indirect loss the nation suffers from our present excessive patent stamp duties, which drive abroad and stifle a large proportion of that inventive faculty upon which alone we are dependent for holding our considerable number of lives now and grants of life lost in preventable accidents, and much and employment for many who are now unable to obtain work, and whom, in consequence, we have to support.

THE OXIDATION OF SULPHUR IN COAL GAS.

In a paper read before the Manchester Literary and Philosophical Society last month, Mr. H. Grimsshaw repeated the charges so often urged against sulphur in coal gas. Mr. Grimsshaw wanted to frame his indictment through the discovery of a drop of sulphuric acid in the globe which surrounds a gas-jet in his hall. He says:

An accident, somewhat peculiar, but very practical demonstration of this fact [the formation of sulphuric acid] recently came under my observation, which I thought might be of some little interest to the Society. On the interior of the glass globe surrounding a gas-jet in the hall of my house I had frequently noticed the presence of drops of condensed liquid. The jet being near the outer door, and the globe consequently exposed to a rather cold current of air, I merely considered it to be drops of water formed by the burning hydrogen of the coal gas, and condensed on the cold surface of the glass. I noticed, however, that when the glass became heated through the turning on of a larger flame, the moisture did not, as it ought, according to all reasonable expectation, evaporate. I was curious enough to take down the globe, wipe out a few of the drops on slips of paper, and rinse the rest off with water, which I preserved. Having my suspicions, from the rather oily appearance of the drop, I warmed the slips of paper a little, and immediately obtained a very fine reaction for sulphuric acid, by the copious blackening and charring of the paper in those places where the liquid had touched it. I then applied the usual chloride of barium test, and obtained a plentiful precipitate of sulphate of barium from the washings of the globe; thus showing, of course, that the oily drops were literally nothing but tolerably strong oil of vitriol.

The formation of sulphuric acid under these particular conditions is a fact well known to chemists. The sulphur contained in coal gas is burnt to sulphur dioxide—itsself a harmless gaseous body at ordinary temperatures. It dissolves readily in water, and the solution of sulphurous acid thus formed, if placed in a current of hot air, becomes partially oxidized to sulphuric acid, the greater part of the sulphur dioxide escaping into the air. It is well known that in the Referee Sulphur Test, the products of combustion of the coal gas, mixed with air and gaseous ammonia, are passed through a long cylinder containing a number of wet glass balls. The sulphur dioxide is dissolved by the water, together with ammonia, whereby a solution of ammonium sulphite is formed—a body more stable than sulphurous acid itself. The hot air passing over the ammonium sulphite slowly oxidizes it to ammonium sulphate. The cylinder is of such a size that all the sulphur dioxide is "fixed" and oxidized on the wet surfaces. The conditions for complete oxidation are—(1) a large wet surface to condense the sulphur dioxide; (2) presence of ammonia, or other alkali, to "fix" the sulphurous acid; (3) the passage of hot air over the alkaline sulphite to fix it. On the other hand, when the products of combustion escape directly into the air, or are drawn through an excess of pure cold water, no sulphuric acid is found among them. The glass globes round gas flames, and the glass vessels hung over gas flames to catch the soot, play the part of the Referees condenser for a short time every evening. When the gas is lighted, some steam, produced by the burning hydrogen, is condensed on the glass surfaces as long as they remain cold. This deposit of water absorbs sulphur dioxide, produced by the burning of the sulphur in the gas, and thus forms a solution of sulphurous acid. This solution, partially neutralized, it may be, by ammonia from the gas, is subjected to a current of hot air, which oxidizes some of the sulphurous acid to sulphuric acid, while the rest evaporates as water and sulphur dioxide. A minute drop of sulphuric acid is thus left on the glass, and becomes the nucleus of a fresh deposit of sulphurous acid when the gas is lighted next day. By this means, in the course of several months, a large drop of sulphuric acid may be produced. But, because sulphuric acid is thus gradually formed on a body held close to a coal-gas flame, it does not necessarily follow that sulphuric acid is gradually formed on the pictures, books, and furniture of a room in which coal-gas is burnt. As a matter of fact, there is no deposit of moisture on the walls and furniture of an ordinary room when the gas is lighted. The atmosphere of a room, even on a wet day, is not saturated with moisture; that is, it can hold more aqueous vapour in suspension. Now, when gas is lighted in the room, the temperature is raised. By the rise of temperature, the saturation point is also raised, so that although aqueous vapour is poured into the room from the gas-jets, the atmosphere does not become saturated with moisture; on the contrary, the room becomes relatively drier—especially those parts near the ceiling, which are said to be the chief victims of the sulphur.

By a simple experiment any one can satisfy himself on this point. Take a wet and dry bulb thermometer into an ordinary room, and read the difference in level of the two mercury columns. Light the gas, and place the thermometer two or three feet from the ceiling. It will be found that the difference between the two columns gradually increases. In other words, the atmosphere is farther from the saturation point, or is relatively drier, after the gas is lighted. Of course, any substance quite close to the gas-jet, such as the globe, shade, or brass-work, will condense a little water on its surface before it gets warmed up. In this case the aqueous vapour from the gas-jet is caught before it has time to diffuse itself throughout the air in the upper part of the room. Besides the very small quantity of sulphuric acid which is formed and collected in the manner we have described, and perhaps a further small quantity which is formed in porous substances, such as the decayed calf bindings of books, and the carbonaceous deposits from the gas flames, the rest of the sulphur is wholly swept away as sulphur dioxide in the ordinary ventilation of the room. But Mr. Grimsshaw asserts that the whole of the sulphur is converted into sulphuric acid in the room in which the gas is burnt. He remarks:

Say that the gas which I burn in my house contains no more than 10 grains of sulphur per 100 cubic feet. This means 10 grains, or about a quarter of an ounce (about) per 1000 cubic feet. I find that I burn on

an average, through five or six jets per evening, 8900 cubic feet per quarter. This contains 890 grains of sulphur, which is equal to 3670 grains of sulphuric acid (H_2SO_4); so that I turn into the atmosphere of my house, mostly into one room, nearly 4 ounces of sulphuric acid in three months. This is 24 ounces, or 1½ lbs. per annum. Now, if I had been burning the Leeds gas, of the quality which has recently been subjected to a good deal of criticism, and which is stated to contain 40 grains per 100 cubic feet, than I should be subjecting the contents of my house to the action of 1½ lbs. of vitriol per quarter, or 6 lbs. per annum. In many cases, certainly in those cases where the contents of the room are most liable to damage, the above amount of gas—namely, that from five or six lights—is given off into the atmosphere of one room.

Almost all the objects in the upper parts of a room are susceptible to damage by the vapour of sulphuric acid. I do not take into consideration the presence of sulphur dioxide, for it is almost impossible that this body could escape conversion into sulphuric acid in a very short space of time, in the presence of oxygen, the vapour of water, and heat. Ceilings, cornices, wall-papers, pictures (with their cords or chains, and frames), books, and so on, are all objects which are susceptible to the corrosive action of the vapour of sulphuric acid, and there cannot be much doubt that in a longer or shorter time they will all suffer from the presence of the sulphur in gas where the latter is burned in any quantity.

Now the experiments of Mr. Lewis T. Wright—noticed in the JOURNAL of the 13th of April last—show that no sulphuric acid is formed in the flame itself. The sulphur dioxide escapes into the air, and is fixed. Unless it is held in solution close to the burner, by water deposited on the shade and fittings before they are warmed up, the dioxide is spread throughout the air of the room, of which it forms about the three millionth part by volume; and since the air of a gas-lighted room is below the saturation point, the sulphur dioxide is not condensed, but passes into the outer air with the carbonic acid and hot air by the usual ventilation exits. In the trial at the Royal Observatory related by Mr. C. Heisch, the products of combustion of a coal-gas flame were passed into a zinc chimney. By this means diffusion was prevented. On cooling down, in its passage up the metal chimney, the steam was, of course, condensed on the zinc, and the deposit of water so produced took up the sulphur dioxide, forming a solution of sulphurous acid, which, just as in the Referees apparatus, was placed in a current of hot air, and, therefore, under exactly the right conditions for rapid oxidation.

It happens sometimes that, owing to a leakage in the water-pipes or roofing, water exudes from the walls of a room, and produces a permanent wet patch on the wall-paper. Such a wet surface will absorb sulphur dioxide from burning coal gas, and this will gradually undergo oxidation. The damp discoloured paper will then be deeply impregnated with sulphuric acid. But we doubt whether the injury inflicted by the moisture itself on the fabric is not greater than that wrought by the acid it produces.

The evidence as to injury done to bookbindings in a gas-lighted room is conflicting. Calf-bound books are found to suffer most; but whether the injury is done by the formation of sulphuric acid on the calf, or by the heat of the room only, is at present a moot point. Professor Ripleys Nichols—whose paper, reprinted in the JOURNAL,* we recommend to the careful attention of Mr. Grimsshaw—shows that sulphuric acid or acid sulphate of ammonia is found in the rotten bindings of books, especially Russia and calf bindings, in larger proportion than could be accounted for by the alum used in the paste and the acid retained from dressing the leather in dilute sulphuric acid. But when calf-bound books have been exposed for a long time to a high temperature, the calf becomes porous, owing to disintegration, and in this state becomes very hygroscopic. It is, therefore, probable that the disintegrated substance takes up water in which sulphur dioxide is condensed and then oxidized, and the sulphuric acid found in the decayed calf is the effect, not the cause of the decay.

CALVERT'S MECHANICS ALMANAC AND WORKSHOP COMPANION FOR 1881.

This is a handy little publication, wherein a calendar forms the skeleton, which is filled out by a mass of instructive and entertaining matter, somewhat in the "Mechanics Institute" vein. We are accustomed to find, in publications of this class, appealing ostensibly to artisan readers, a dreary compilation of perfectly frowzy cuttings and elementary "original" articles hashed up together, on the principle that anything is good enough for the intelligent mechanic. We do not believe that because a man may be able to put a few sentences together more or less grammatically, and to get them printed, he is thereby constituted the artisan's superior to the extent of being warranted in writing down to the assumed level of the mechanic's intellect. The workman's intelligence, though probably limited to a few channels, is by no means feeble in direct proportion to its narrowness; yet, to glance over some specially designed appeals to his attention, it would appear that he is considered by some writers to lack the commonest elements of knowledge, even in his own restricted walk in life. To these attempts to put workmen into leading-strings is to be ascribed much of the failure that has attended the practical application of the once-popular mutual improvement idea. The present little manual is certainly better provided than usual with sound information for workers. Mr. Lloyd Wise contributes an article on the Patent Laws, full of advice to inventors, by attention to which they may save much expenditure of time and money in the maze of the law. There is a simple string of instructions in the use of gas in dwelling-houses, and there are other contributions of equal utility. On the whole, we are disposed to recommend this almanac as being a good example of its class.

* See JOURNAL, Feb. 10, 1880; Vol. XXXV., p. 208.

† Manchester: J. Calvert. London: Simpkin, Marshall, and Co.

A NEW PHOTOMETER.*

In this pamphlet the author, who is described as Chief Engineer to the gas engineering firm of F. Schweickhart and Co., of Vienna, propounds a theory on the scientific measurement of light by means of a photometric apparatus of his own invention. The method in question is claimed to be free from the defects of the Bunsen and all other photometers yet produced. The author promises to publish shortly an exhaustive treatise on photometry, wherein we may presume the existing methods will be extensively sacrificed, and his own proposals as forcibly advocated; but, for the present, the publication before us is not lacking in either respect. Herr Coglievina devotes the first part of his book to proving the preamble with which he starts—that the Bunsen photometer, in its selection of a standard, in its screen or disc arrangement, and in its scale, is unscientific, unreliable, difficult to manage with accuracy, and generally unsatisfactory. With the general gist of his indictment of the normal candle most of our readers will be already familiar, as he merely repeats the complaints of others who have endeavoured to supplant it with fresh devices. None of the well-known standards advocated by Messrs. Methven and Vernon Harcourt, or the various kinds of lamp standards suggested or in use, meet with his approval, the first-named apparently offending him very deeply, not only on account of its alleged inefficiency, but also because its authorship is claimed by an Englishman, whereas, according to him, it was suggested by Dr. Rüdorff long before Mr. Methven took it up. Dr. Rüdorff has abandoned it, and Herr Coglievina appears to think it time Mr. Methven and his friends followed suit.

We need not follow our author in his disquisitions upon the ordinary screen and scale, but will proceed to state as briefly as possible the requirements of a perfect photometer on his system as laid down in the second part of the pamphlet. These are six in number, as follows:—(a.) the beams of light must be made to take a certain direction; (b.) the light must be at a certain height; (c.) the image of the light must be capable of reliable observation; (d.) the scale should be plain; (e.) a new reliable unit of light must be determined; (f.) a name in unison with the present state of science must be conferred on this unit. It will be observed that, in this list of desiderata, certain things in universal demand are mixed up with requirements only intelligible in view of the author's own apparatus. We will take the proposed new unit first, as being really the point of departure, subsequently dealing with its application. Herr Coglievina lays down the incontrovertible axiom that all beams of light, from whatever source derived, have a certain determinable point at which they cease to illuminate objects. As he puts it, a source of light is the centre of a lighted sphere of finite radius, the relative illumination of any points within the sphere being inversely proportionate to the square of their distances from the light-centre. Consequently, if we select any of the rays, for convenience sake rendering them parallel and of a definite size by a suitable lens, and adopt some means of finding the length to which these rays are visibly projected, we shall obtain a fixed datum by which to value any other rays sent from the same light-centre in another direction, and by the same means we shall have a fixed term of value for the light itself. For example, if a feeble light, such as that from a lamp or a small gas-jet, be displayed in a dark room, dark objects in the distant parts of the room would be invisible unless brought to within a certain distance from the lamp. This distance, then, is the length of the longest beams of the light given by the lamp, and is the normal coefficient of the light, by reference to which light beams from any other source are measurable.

If a photometer were to be constructed simply on this principle, it is evident that it could be used only for very feeble lights, or its dimensions would be outrageous. The principle is, however, susceptible of modification to the extent required to bring it within the range of apparatus of the ordinary size. By focussing the light in a double convex lens, so as to get a bundle of parallel rays of definite diameter, and then reflecting these rays through a series of silvered reflecting prisms, the length of the rays may be greatly diminished, and their termination brought more easily under observation. Now comes the question of how the end of the rays is to be detected. The author employs for this purpose a ball of phosphorus enclosed in a case, exposed to light only through an orifice just large enough to admit the rays projected through the prisms before mentioned. The phosphorus itself is kept in a perfectly dry air-tight glass tube. [It should be stated that the author does not confine himself to the use of phosphorus; any non-inflammable material, being with the impact of light, would answer the purpose.] The phosphorescent ball is, of course, visible in the dark, but the phosphorescence ceases when it is touched by a beam of light. Hence if a beam projected, in the manner described, from a controllable source of light just reaches the phosphorus, the beam may be said to be of the normal length. If the beam is too strong, and extends beyond the phosphorus ball, which will be seen by the phosphorescence entirely ceasing, the light must be lowered until the exact effect is obtained. This light is the unit from which any other light can be measured. For, in the arrangement shown by the author, the rays from the right-hand side of the standard unit are focussed and mirrored to determine the normal length of ray, while the left-hand rays are similarly focussed into a parallel bundle, and directed by two reflecting prisms to an opaque ball, of equal diameter to the rays. The light to be measured by this standard is placed opposite to it, and a similar bundle of its rays is directed to the other side of the opaque ball. The author states that a ball thus illuminated from both sides, when observed by reflection in a

plane mirror, is much more reliable than the screen or disc of the Bunsen photometer. The ball shows distinct light and dark hemispheres, with a sharp line of demarcation, when the two lights are very slightly unequal. He states that the observer's notice is in this case easily caught by the simple line dividing the two hemispheres, when he might not be able to appreciate the same difference between the two sides of a paper disc.

Herr Coglievina gives many diagrams in illustration of his argument, and also two plates showing his photometer in elevation, plan, and section. It will not be fair to the ingenious author to describe his apparatus more minutely, nor is it necessary in order to appreciate the *rationale* of his method. As we have seen, he depends entirely upon certain points which will assuredly be speedily put to the test. Recapitulating very briefly, we have seen that his standard, *a*, is a light of any kind—but preferably of the same nature as the light to be measured by it—of such intensity that its longest beams have a certain length, *ax*. This length is to be tested by a certain substance—for example, phosphorus—which being fixed at the point *x*, denotes to an observer, who watches its image in a mirror, when the rays from *a* just reach the point *x*. This being settled, the standard, which may be called by any definite name, becomes an entity as rational as a degree of the thermometric or barometric scale, and as universally applicable to all kinds of light as those scales are to the general measurement of heat and pressure. In fact, we shall have to discard the unscientific term "candle power," which is as vague as though we were to use the phrase "oven heat" for temperature, or any other similarly loose expression for the measurement of weight or volume; and speak of illuminating power in terms that will convey some idea of the distance to which the light-rays will penetrate. This is a solution doubtless to be desired, but it remains to be proved whether Herr Coglievina's standard is destined to lead us any nearer to it or not. The manner of determining the length *ax* is at least open to question. Again, there is much to be said respecting the author's selection of an opaque ball, instead of a disc, as a light-recipient.

With a single reference to the title of the instrument our notice must close. It is called a centigrade photometer for the following reason.—The normal light having been adjusted in the right-hand compartment, the light in the left-hand division is made exactly ten times as powerful by a ready method of adjustment. This multiple of the standard is now taken as the normal, and a light up to ten times greater intensity may be measured in the right-hand box where the normal standard was first exhibited. Thus, by advancing in a centigrade proportion, on each side alternately, a light of any power may be tested in the same apparatus.

The usual extra fittings, such as meter, clock, &c., are, of course, used in connection with the new photometer, when intended for measuring the illuminating power of gas.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

DR. ADAMS'S GAS STOVE.

SIR,—A few days since I wrote you a letter, in reply to a communication from Mr. Bruce on this subject, and I have just now seen in the *JOURNAL* of the 7th inst. Dr. Adams's letter of the 27th ult., in which he charges me "at the head of three columns." I find it difficult to reply to Dr. Adams, as in November he gives a flat denial to the statements made in October by Mr. Wright, of Birmingham, the very witness he asks me to refer to as one "who is co-operating with him in a series of tests."

Dr. Adams charges me with "a pure fabrication" in saying that "the new stove, by Dr. Adams's own statement," gives 8 to 16 times as much useful effect as any stove hitherto made." "This alleged quotation," he repeats, "is a pure fabrication. I never made the statement and never held the belief it expresses."

So far Dr. Adams of November. Now hear his collaborator, Mr. Wright, in October:

"As a means of comparing the results obtained from this with those obtained from other stoves, we annex particulars of tests made by Dr. Adams and Mr. J. J. Bruce. No. 1. gas stove gave the best results of any ordinary gas stove that was tested, and is therefore fairly used for comparison with No. 2 (Dr. Adams's new stove)—

	Units of Heat Utilized per Cubic Foot of Gas,
No. 1 stove (giving the best result of any gas-stove hitherto made), burning 100 cubic feet of gas per hour	3,638
Do, burning 134 cubic feet per hour	6,240
No. 2 stove (Dr. Adams's), burning 123 cubic feet per hour	51,390

"These results are certified, and may be taken as correct, and a fair comparison between the two stoves."

If the English language means anything, surely this statement means that the results were certified by Dr. Adams and Mr. Bruce.

Now, if we compare the second test with the third, since 51,390 ÷ 6336 = 8.1, Dr. Adams's stove was over eight times more efficient than the best gas stove hitherto made; while if we compare test No. 1 with test No. 3, we find it (51,390 ÷ 3658 = 14) times better than "the best." Dr. Struck with the monstrous exaggeration of such a number, I wrote 16 instead of 14 times, looking probably at the thousands, and neglecting the smaller numbers. This, however, makes no practical difference in the effect of an exaggeration as gross as I ever met with. If there is any "pure fabrication" here, it surely is not mine.

Next Dr. Adams denies the accuracy of my figures of the weight and the specific heat of air. With respect to the first, he says that a pound of air at 62° Fahr. is equal not to 13.140 but to 13.156 cubic feet. The difference is of no importance whatever to the question; being of far less than 1 per cent., and not much more than 1 per mille. But as my accuracy is impeached, I must again refer Dr. Adams to one of the authorities quoted by himself—namely, Mr. Kinnear Clarke's useful "Manual of Rules, Tables, &c."—where, at p. 351, he will find the

* Centigrad-Photometer: Neues Optisches Instrument zur Directen Bestimmung der Intensität jeder Beleuchtung. Lichtquelle. Von Domenico Coglievina. Braunschweig: F. Vieweg und Sohn. 1880.

number of cubic feet in 1 lb. of air at 62° given as 13.141. I did not think it necessary to go to the third place of decimals.

The next charge of inaccuracy is certainly the most astonishing instance of hair-splitting I ever heard of. Mr. Bruce unites with Dr. Adams in making the grave charge against me that I put down the quantity of heat necessary to raise 1 lb. of air 1° Fahr. as 0.237 instead of 0.238 of that necessary to raise 1 lb. of water through the same interval. I made a mistake in the third place of decimals! Indeed, Dr. Adams refuses upon Mr. Bruce, the latter saying 0.2380, the former 0.2379. I feel guilty; but practical men will, perhaps, condone the offence when they remember that with coal at even 18s. 8d. per ton one gets 10 lbs. of coal for 1d.; that each pound gives 14,000 thermal units; and that a difference of 1 in the third place of decimals means one-thousandth of an unit, or in money value the one hundred and forty millionth part of a penny. I am quite as ready to acknowledge such an error, as I am sure Regnault would have been unwilling to bind himself to that accuracy in the fourth place of decimals to which Dr. Adams seems to tie him down. It appears strange that any one who understood the nature of Regnault's beautiful processes should have imagined that such accuracy was attainable in so difficult an investigation. "*De minimis non curat lex*," but the Doctor cares about minims which the law disregards.

Dr. Adams's calculation founded on his figures—viz., that $13.14 - 0.238 = 50.5$ —is evidently a slip of the pen which may happen to any one. The quotient, of course, should be 55.21. My original statement being 55.5, there is a total difference of about $\frac{1}{2}$ per cent. Thus the "*material*" difference becomes utterly immaterial.

For Dr. Adams's information about "burnt air" I should be grateful if it were either novel or admitted by better authorities. Through all his other statements I have no time to travel, but will give a specimen of one of his witnesses—Dr. Ure's "Dictionary of Chemistry"—a book, by the way, of no authority. It is from this quoted that 1 cubic foot of gas can warm an apartment of 2500 cubic feet contents from 60° to 80°, or 20° Fahr. Such an apartment would be about 16 feet square and 10 feet high. The room in which I am writing at present is of less capacity than this. I have been sitting in it for five hours with three lights burning, each consuming 4 cubic feet of gas. As Dr. Ure says that 1 cubic foot of gas heats such an apartment 20°, 60 cubic feet must have heated it 1200°. Strange to say the lead pipes have not melted, the brass fittings are not red-hot. The paper I write on is not burned to a cinder, my steel pen, I am happy to say, has not lost its temper, although it has been charged with *fabrications* puro or impure. I enjoy, I trust, the "*mens sana in corpore sano*," the latter being only comfortably warm and the former perfectly cool. As I am ambitious to be a martyr of science, I am willing to remain for an equal length of time in the same room with double the number of feet of gas burned in Dr. Adams's stoves, and a lady has offered to be executed with me in order that posterity and Dr. Adams may inscribe on her martyr-tomb:

"Then the toast, then the toast shall be dear woman."

Neither my time nor the patience of your readers would allow me to follow Dr. Adams through all his devious windings—about coal, illuminating power, &c.—which have nothing whatever to do with the question of Regnault's experiments. Dr. Adams's experiments, which he himself gives as only rough approximations. In his deductions from these experiments I do not at all agree, for reasons which I will at some other opportunity point out, and which I think he will admit to be sound.

In conclusion, I may say that on the day following the appearance of my first letter I received from a gentleman with whom I have only a slight acquaintance, and who occupies a very high position as a scientific and practical investigator of similar questions, a letter thanking me warmly for my communication, and characterizing the statements therein as Dr. Adams's stoves in words which it would be unpolite to that inventor to recite.

Cork, Dec. 9, 1880.

DENNY LANE.

Sir,—Mr. Lane, in his letter referring to my stove, gave 13.156 as the weight of 1 lb. of air at 62° Fahr., and 0.237 as the specific heat of air, and dividing the former by the latter, he brought out 55.5 as a divisor for my units. In my commentary I gave 13.14 as the weight of the air, and 0.238 as the specific heat; and dividing the first by the last, I brought out 55.5, instead of 55.2. This error is caused by mistaking a badly-formed figure of 5 for a figure of 0—in short, a slip of the pen which I am transmitting a copy from my rough jottings of memoranda. My letter was written while on the way to London from home.

JAMES ADAMS, M.D.

[At our correspondent's desire, we forwarded a copy of this letter to Mr. Denny Lane, in anticipation of his commenting on the error pointed out; and it will be seen from his letter, printed above, that he notices the error merely as "a slip of the pen."—Ed. J. G. L.]

PORTSMOUTH DISTRICT WATER COMPANY.—The ordinary half-yearly meeting of this Company was held on the 30th ult.—Mr. F. Weatherly in the chair. The Directors' report, which was presented, stated that, owing to the stagnation of trade in general, and the depressed condition of the industries of the district, there had not been any increase in the Company's business. The Directors anticipated, however, that the money now being expended on the docks and railway would lead to an improvement of the general condition of Portsmouth, and consequently to an extension of the Company's operations. The Chairman, in moving the adoption of the report, said that as the Directors had had, in the course of the past half year, to issue debentures to pay off the contractors, they were left with a balance in hand of only £38 11s. 9d. out of the revenue, and it would be for the consideration of the Shareholders whether or not a dividend should be declared out of this small amount. He then referred to the causes which had operated to retard the progress of the Company in the past half year, but assured the Shareholders that every attention was given to their affairs by the Directors, and with the appointment of a Manager, which was in contemplation, it was hoped that the value of the Company's property would be increased. Mr. C. Fisher seconded the motion, which was carried, and the proceedings closed with a vote of thanks to the Chairman.

Miscellaneous News.

SOUTHWARK AND VAUXHALL WATER COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held on Thursday last—Alderman H. E. KNIGHT in the chair.

The SECRETARY (Mr. A. Jelley) read the advertisement convening the meeting and the minutes of the last meeting, which were confirmed. The report of the Directors, which was taken as read, contained the following remarks:—

In the past half year 2318 new supplies have been brought into charge, the estimated annual total from which is £4036; and during the same period 11,691 yards, or upwards of 6 miles of new main have been laid, of which 256 yards are not within the Company's area; 2100 yards of existing mains have also been altered, relaid, or lowered, to improve the service of the district.

In consequence of the action of the Government respecting the Water Supply of a Bill lately introduced in the House of Commons, the Directors have under the necessity of introducing to Parliament for the purpose of obtaining powers for the construction of additional works, &c. Notices have been given by Government for the introduction of a Bill into Parliament in the ensuing session to carry out the recommendation of the report of the Select Committee on the Metropolitan Water Supply: such Bill will receive the earnest attention of your Directors, in order that the interests of the Shareholders may be duly protected. Your Directors have again, with regard to all attention to the very heavy legal and other expenses which have been forced upon the Company in consequence of the proceedings in Parliament and otherwise, respecting the question of the Metropolitan Water Supply.

Your Directors recommend that a half year's dividend at the rate of 7½ per cent. per annum on the ordinary stock and class "D" shares of the Company, and 5 per cent. per annum on the preference stock of the Company, be declared.

The CHAIRMAN, in moving the adoption of the report, said the Shareholders would find, on looking at the accounts, that the only addition to capital in the half year was £3076, £2590 of which had been expended on new mains and pipes. The revenue account to the 30th of September last showed that £918 had been expended on maintenance and repair of impounding and service reservoirs, filtering-beds, &c., and this amount compared with half year's expenditure of £2200 in the corresponding period of 1879. They had spent this money in pursuance of their determination that the water supply should, as far as possible, be of the best description, and to do this they had incurred extra expense in cleaning the works often than usual. On maintenance and repair of mains £990 had been expended in the last half year, and £900 in the corresponding period. Pumping and engine charges, including the cost of coils, wages, &c., were this time £10,100, against £10,700 previously, and £10,300 in the corresponding six months of last year. The Directors had effected a saving in this item of £490 by the new coal contract. On filtration charges they had expended £2200 in the last half year, and £2000 in the corresponding period. Pumping and engine charges, including the cost of coils, wages, &c., were this time £10,100, against £10,700 previously, and £10,300 in the corresponding six months of last year. The Directors had effected a saving in this item of £490 by the new coal contract. On filtration charges they had expended £2200 in the last half year, and £2000 in the corresponding period. Pumping and engine charges, including the cost of coils, wages, &c., were this time £10,100, against £10,700 previously, and £10,300 in the corresponding six months of last year. 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necessary to maintain the efficiency of the undertaking throughout. After next half year this amount would again steadily increase, as their increased earnings would be *plus* the £4000 they had been paying half yearly out of revenue to Messrs. Harvey. This payment would then cease, in the house-charge temporary loans stood at £230,000, against £29,000, but it had since all been paid excepting £5000, and he expected that the balance would be on the other side in a few days. The item of £8196 in suspense for expenditure on account of works had been increased by making experiments respecting other sources of supply. It was often supposed by people outside that water companies rested on their oars, and took not the slightest trouble as to what should be done to improve their supplies; but the companies did not take things so quietly. In the past twelve months they had been very actively at work in considering other sources of supply, and, in fact, he thought, the Metropolitan Waterworks Company had accomplished something which he believed would be hailed with great satisfaction. This was all he knew of to call the Shareholders attention to respecting the accounts. Passing to the report, he went through and commented upon the various paragraphs. Clause 2 stated that in the past half year they had laid as much as 11,000 yards of new mains, which, in itself, demonstrated the elasticity of the undertaking. Of this 256 yards were laid outside the Company's parliamentary area, but this could not be helped. As he had explained on previous occasions, these mains outside the areas were paid for by the parties requiring them. It was further stated that 94,000 yards of existing mains have also been altered, raised, or lowered, and that a great deal of work had been done in the districts where the mains had been altered were able to have a much better and stronger supply of water; and that the water, if required on an emergency in any particular locality, could be more easily and rapidly concentrated. He also meant that those mains which were too near the surface to be exposed to the possibility of being cut. These matters were of the highest importance, and were paid for out of revenue. The Directors had not found it necessary in the past half year to act on the Shareholders resolution to raise further capital; and the exercise of this resolution would depend on the proceedings of Parliament; but the resolution would be acted upon as soon as it was necessary. The report stated, as he had already mentioned, that the Company withdrew their Bill consequent on the action of the Government respecting the Water Supply of the Metropolis. He had stated the expenses incurred in the prosecution of the Bill, and clause 6 of the report referred to the very heavy demand on the Company's resources. He had mentioned these items together, they amounted to £5543 in the year, which meant 1½ per cent. dividend on their ordinary stock for the half year, and but for these expenses the Company could have paid on the present occasion a dividend of 9 per cent. instead of one of 7½ per cent. He contended that they ought to pay for the share of the public, and he pointed out that proved that the water companies, who had served the public faithfully for so many years, and for years did not earn one penny in dividend, if let alone, and not forced to pay these shameful expenses, would soon reach their parliamentary limit as to dividend, and then be able to make very large reductions in their water-rates, the sooner the public understood this the better. The Bill which the Government had notified their intention of introducing into Parliament next session to carry out the recommendations of the report of the recent Select Committee on the Metropolis Water Supply was to create a Water Trust, and this would again necessitate the Water Companies going to Parliament. They did not object to the establishment of a Water Trust, or to their undertakings being purchased—they only wanted a fair price; and they would all strenuously act so as to ensure fair treatment. Nothing was more calculated to shake confidence in all joint-stock companies than the application of public money to depreciate these undertakings. He did not believe the House of Commons would tolerate such a thing. The Directors would carefully watch the Bill. The Board had considered the question of the Auditors remuneration, and recommended an increase in their fees from 20 to 30 guineas. The retiring Directors were Alderman Stone, Mr. Noel Whiting, and Alderman Finnis; and the retiring Auditor was Mr. C. J. B. Hertel, and he counselled the Shareholders to re-elect the retiring Directors, and he should again refer to the question of the rating, and he reminded them that the old assessment of the Company in the various parishes was £20,526, the average rate on which had been 6s. in the pound in the past three years. This £20,526 was settled only five years ago, and it was proposed now to increase it to £39,000, which would have raised their rate from 6s. to 10s. 6d., or to £40,000, or to £50,000, and it was actually proposed to be increased to £60,000 for the next five years! The Directors had settled with all the parishes excepting four for a total assessment of nearly £19,000, and the four parishes they were in dispute with came at first about £4000, which they had reduced to £131,000, and the previous year's assessment in these four parishes was £17,000. The Directors, however, had contended that this £31,900 was perfectly ridiculous, and they wanted a very much larger reduction. Suppose nothing were taken off this £31,900, it would mean that the Company would altogether be assessed at £20,000 more, and 6s. in the pound on that amount represented £6000 per annum, or about 1 per cent. on their ordinary stock. But for the law expenses to which he had referred, the Shareholders would now be receiving 9 per cent. instead of 7½ per cent., and for this increase in their assessment they could pay next year 10 per cent. and the consequence would have been that, if their limit being reached, they could have turned their attention to reducing the water-rates. The very figures, within a few pounds, which he placed before the late Mr. Smith, had been realized. He told Mr. Smith that the Company would pay 7½ per cent. up to June, and have a few thousands over; and they had paid 7½ per cent. up to June, and had £10,000 over. The increase which Mr. Smith had accepted was £20,000 over £3500, whereas from new layings on in the last half year they would have over £4000. The public had yet to learn and to regret the bargain they had lost, and the Shareholders had yet to learn that the Shareholders' views of the water-rates were not too sanguine. As it was, the Directors could have paid 8½ per cent. dividend on the present occasion, and have carried over something, but they thought it better to carry over not less than £5100. During the last three or four years they had raised the dividend from 2 to 7½ per cent., had reduced the complaints to a minimum, and had made considerable improvements in placing the mains in a thorough state of efficiency, and in vastly improving the quality of the water. The Company had not increased their water-rates as far as the Act of Parliament enabled them, and finally their stock, which was selling at £100 when he joined them, was now worth £223.

Mr. C. M. VALLIS seconded the motion, which was carried unanimously. The Chairman then moved the declaration of the dividends recommended in the report.

Alderman FINNIS seconded the resolution, and it was carried unanimously.

The retiring Directors and Auditor were then re-elected, and a resolution increasing the Auditors fees, as recommended by the Board, was passed.

Mr. DUCK then moved a vote of thanks to the Chairman and Directors,

and warmly thanked the Chairman for his full and lucid explanation of the Company's affairs.

Mr. J. WALL seconded the motion, which was carried unanimously.

The Chairman acknowledged the compliment, and the proceedings terminated.

THE PRICE OF GAS AT ROCHDALE.

The Rochdale Town Council met on Thursday, the 2nd inst.—the Mayor (Alderman Baron) in the chair—and in the course of their proceedings the minutes of the Gas Committee were presented. These, among other things, stated that the Committee had resolved "that the price of gas be reduced 3d. per 1000 feet both inside and outside the borough, as and from the 1st day of January, 1881." Notice had also been given by Alderman Tweedale that at the meeting of the Council he would propose, as an independent resolution, that the price of gas be reduced 4d. per 1000 feet. Mr. PRIZIE, in moving the adoption of the minutes, said he had not anticipated having to introduce the subject of reducing the price of gas, inasmuch as Alderman Tweedale had given notice of a motion on the matter; but at the usual meeting of the Gas Committee on the previous evening the subject was introduced, and after referring thereon thoroughly discussed, the recommendation to reduce the price was agreed to by only two dissentients. The Council rejected a similar proposal of the Committee some time ago, but the reduction now suggested represented considerably less than the amount which was added to the revenue account last year, and therefore, even if the reduction was made as proposed, the price of gas in this case would be as large as it was five years ago. This was altogether independent of any prophecy as to how far the future might be better than the past had been, for he deprecated anticipations and speculations as to what might possibly be the profits. For his own part, he wished the reduction had been 6d. instead of 3d. per 1000 feet, for in this case the amount of correct poison was a great deal less. The profits last year were quite as large as—he himself thought larger than—they ought to be. He did not think the Committee paid off enough by way of depreciation, though he hoped this would be set right in next year's accounts; but if they paid off the interest on loans, and a fair amount for depreciation, then he thought they ought to be satisfied with the reduction of 2 or 3 per cent., and he hoped before very long the Committee would ask the Council to go farther in the way of reduction than they now did. If he thought there was any chance of carrying the proposal, he should like to move that besides reducing the price, as recommended, the charge for lighting the street-lamps should be reduced 10 per cent. If the price of gas was reduced 3d. instead of 7½d., as at present, should be set aside each year by way of depreciation. After making all these deductions, they would still have at the end of this year a handsome surplus to hand over to lessen the rates of the town, even if the consumption of gas showed no increase over that of the year last. He replied to a question as to whether he believed that the reduction in price was equal to about £800 on the ensuing quarter, which was the last of the present municipal year, or equal to about £2600 per annum. The present invoice price of gas was 3s. 1d. per 1000 feet; but the smallest consumers who paid promptly had it for 3s. 9d., and the largest consumers for 3s. 6d.; as to the question of reserve funds, he said that on the 1st of January, when the gas works, after deducting the proposed reduction of 3d. per 1000 feet, he might say that last year the surplus profits and the interest paid on loans represented 9½ per cent. on the mortgage debt. If they made the reduction, the profits this year would still be larger than last, so that they would represent more than 10 per cent.; 4 per cent. of which was absorbed in paying the interest on loans, leaving 6 per cent. to go towards the rates.

Alderman TAYLOR said the amount of money which their Act of Parliament obliged them yearly to repay of their borrowed capital was only 1-15th, but the last period for recouping the interest was about to expire, and he thought, when the works were taken over, it was agreed that 2½ per cent., or 1-40th part, should be set aside annually. This resolution, he believed, had never been rescinded, but when the time for repayment was extended it was ignored, and ever since the Gas Committee had only been paying off 1-15th yearly, which confessedly was not enough to pay the interest. Mr. CHURCHILL said that the Committee was in favour of a return to the old practice, and he commended him for his desire to make the lighting of the lamps a charge upon the gas-fund.

Alderman SMITH thought the town was too heavily indebted in the shape of rates, owing to expenditure which was as great as it was profitable, and he thought that the ratepayers were not getting a fair deal, and that they should pay a cheaper rate than consumers could themselves supply if sold, gas was a question whether the Council should dispense with what fell so equally and was so voluntarily paid as was the revenue derived from gas. He thought it would be better to take over the street-lamps, which would reduce the rate to the borough rate, and he thought it was so much to reduce the feeling, both inside and outside the borough, that the Corporation were not justified in making the extravagant profits which were shown in their yearly accounts. The charge for the lamps was one which might very properly be taken out of the gas profits, inasmuch as they constituted a convenience alike for those inside and outside the borough who might have business in the town. He also thought that though the outside consumers might not be charged more than a commercial price, and could not supply themselves for less, still, rather than afford them any temptation to do so, he would reduce the price to them; but as for those within the borough who had no other means of revenue, he thought it would be better to reduce the price of gas, and he thought that the Corporation were not justified in making the rates, he did not consider they had any just reason to claim a reduction.

Mr. JOHNSON said that the way in which the gas profits were to be applied was regulated by Act of Parliament, and therefore they were wasting time in discussing theories as to whether the gas profits should be applied to the use of the thing, if the whole of the property in the borough was of the same description, and all rated upon the same assessment, and all occupiers alike burned gas in proportion to their assessments, there would be no injustice in making gas a means of indirect taxation; but they knew that, as a fact, none of these premises was correct. From figures laid before the Gas Committee at their meeting on the previous evening it had been calculated that if a reduction in the price of gas did not take place, the profits at the end of the current year would be £12,000; which meant a reduction in the rates of 1s. in the pound. And how would it operate? To this way the occupiers of warehouse property, who consumed a comparatively small amount of gas, would escape the rates by that amount; while the cottage consumers, who burnt a large amount of gas relatively to their assessments, would have to make it up. He was only sorry, therefore, that the proposition was not to reduce the price of gas 6d. instead of 3d. per 1000 feet. He considered, as they were surrounded on all hands by level boards who could, if they chose to apply for it, obtain power to make their own gas, it would be folly for the Corporation to abuse the monopoly they at present possessed by charging such a high price as would drive the people outside the borough to seek a supply of their own. He believed in the Corporation's power, who consumed a great deal of gas, and also providing, by a reserve fund, for any possible contingency; but beyond this, the greater the profit the greater the injustice on different classes of ratepayers. Since the works became the property of the Corporation a sum of £113,887 had been handed over in

the shape of profits, and had it not been for the immense sums spent on the reconstruction of the works during the latter years of Alderman Simpson's chairmanship of the Gas Committee, he believed they would have had no difficulty in reducing the price of gas at Rochdale to the same level as that of Manchester or Leeds, and in still making very fair profits.

Mr. J. CHETHAM said when the proposal to reduce the price of gas was last before the Council he opposed it, but now the profits were so greatly increased that he should support it. He hoped they would try to make 3d. per 1000 feet better, as they had not proposed to reduce the price 6d.

Alderman LITTLEWOOD said, as to the inequality in the contributions to the gas profits, he remembered one year taking the different amounts raised from gas profits by four different classes of property, and found that a cottage and a shop and a warehouse paid the same proportion of the profits, but the discrepancy between a shop and a warehouse was something enormous. The warehouse got off almost scot free, while the shop paid a large proportion. Therefore the Council had no right to raise from gas more than a fair amount of profit upon the capital employed in its manufacture, and what was made above this ought to go in reduction of price.

Mr. BIRCHALL thought 10 per cent. was a fair profit—more than fair—and believing they would have above this if they did not reduce the price, he was in favour of the proposition.

Alderman TWEDALE, pointing out the inequality of raising rates by means of gas profits and income tax, whose rates at £100 per annum amounted to a shop rated at £50. If, he said, the rates were paid in proportion to value, so the shop would pay about one-half what the warehouse paid. If it paid rates through gas profits, it would pay four times more than the warehouse. Then a house rated at £10 ought only to pay in rates about 1d., to which he added by the gas profits, something like 1d. more. When the profits, the occupier would pay ten times the amount. The profits from the gas supply for the last ten years had been something like £60,000, which, if turned over to the General Purposes Committee, after paying interest on borrowed capital, depreciation taken off, and everything, would have been enough to pay over 5 per cent. interest. When the price of gas had been able to pay over 5 per cent. they had reduced the price of gas. Now they were in a position to pay considerably more than 5 per cent., and it was their duty to reduce the price more than was decided upon by the Gas Committee. If it was such an equitable way of paying rates for gas, why might gas not be some money investor. When the price increased to 3d. per 1000 feet, and the rate of gas was reduced, the abolition of the charge for gas for the street-lamps, and as the contracts for ammoniacal liquor would expire next year, and as they could sell this product for £3000 or £4000 more than under the present contract, they might reduce the price of gas as well as reduce the charge to the street-lamps.

The Mayor said, as there had been an increased consumption of 5 million feet of gas between the 25th of March and the previous Saturday, as compared with the corresponding period of last year, he was glad the Council had not reduced the price when the question was last before them, because in that case the increased consumption would have been attributed to the reduction in price. He did not think if the price had been lowered the consumption would have been a single foot more, and he must claim the increased consumption as an argument in favour of keeping the price as at present, because it showed that when people wanted gas they burned it at the price they had to give for it. Nothing had been said about the price of coal, which was going up, and if trade improved, as it had done during the last 18 months, the revival must reach the Rochdale district, and no one could say what would have to be paid for coal. Therefore if they lowered the price of gas they were going to do what the late Lord Derby described as taking a "leap in the dark," and in this he should have the concurrence of Mr. Johnson.

Mr. JOHNSON: I beg your pardon, I do not endorse that. It is a leap in the light we shall take.

The Mayor said, aggressively speaking it might be a leap in the dark to lower the price of gas in the face of a rising coal market. There was evidence of an improving trade, and therefore they ought to have cheap contracts for coal for two or three years before reducing the price of gas. Another point he would put was this. The large consumers now had gas at 3s. 6d. per 1000 feet; the receipts of the Gas Committee last year were £5773; the profits, handed over to the general purposes committee, were £4886; the difference between the receipts and the profits declared was £42,157; the gas thus cost nearly 8s. 4½d. per 1000 feet. If, therefore, the Council accepted the proposed reduction, he should be very much astonished. He maintained that many hundreds of the small consumers, whose meters had to be inspected and their consumption at regular intervals, were an actual loss to the town, and thus other ratepayers had to bear the burden this imposed. If the Council took 3d. per 1000 feet off these consumers, it would be put upon the shoulders of others, and landlords could not increase their rents to recoup themselves for the additional rate they had to give for the lessened gas profits, while the cottagers did not pay any rates directly. As to the outside consumers, they would soon help themselves if they could do better, and there had been no complaints from the outside districts. Further, the Council ought to make large profits to provide against contingencies for the electric light, which had become an essential plant at the gas-works would only be worth old iron, old stone, and old timber. As to the £12,000 estimated as profits for the present year, he should believe in it when he saw it. They had a distinct right to raise money through gas profits for public improvements, and for every 3d. per 1000 feet they took the price of gas they had to put 3d. on the cost on rates, for 1d. per 1000 feet of gas meant £1000, and a rate of 1d. in the pound meant about the same. Therefore, if there was any force in the argument on the other side, why not sell gas at cost price at once, and if there was any acquiescence at the gas-works, rate for 1s? He, as Chairman of the Finance Committee, would resist all attempts to reduce the income from any source whatever; because they could not afford to give up any source of income. They would eventually have to come back to a 2s. 6d. improvement rate and a 10d. paying-rate, or he did not know where they were to get their money from. He proposed as an amendment—*That the members of the Gas Committee be compelled to reduce the amount of that portion referring to the proposed reduction in the price of gas.*

Mr. WHITWORTH seconded the amendment.

Mr. HEAPE said when the motion for a reduction was last before the Council he opposed it, but he should now support it; as, notwithstanding what had been said on the other side, he thought a good case had been made out by the Chairman of the Gas Committee. Not being a member of the Gas Committee, he had not been able to go minutely into the case of the small consumers; but the Mayor had put it strongly that they were a loss to the town, and it seemed to him a fair way of meeting the case would be to make a charge for inspection or hire of meters, though it might be an unpopular proposal.

Alderman TWEDALE said he should like to know where the gas profits came from if they accepted the Mayor's calculations. The Mayor tried to make it appear they were selling gas at about the price of production; but he was forgetting the £5000 or £6000 value of the residual products.

The Mayor said he gave credit for £51,000, which included £5292 for ammoniacal liquor, coke, cottages rents, &c., and the declared profits were £8866.

Alderman LITTLEWOOD said that the £5292 ought not to be included, but deducted. As Mr. Petrie had said, they could reduce the price of gas and yet their profits next year would be larger. How could the Mayor's argument be right in the face of that?

Mr. PETRIE wished to say a word or two on the point mentioned by Mr. Heape and others as to the cost of collecting from small consumers. There was no doubt that they were bad customers, and that the cost of collecting their accounts was a large proportion of what they paid for gas. The gas department paid for inspectors £490 per annum, which divided by 16,000 consumers gave 9d. for each as the cost of inspection. This, on a very small consumption, would be a large proportion of what was paid for gas; but it did not interfere with the present proposal. It was a thing that must be remedied in its own way. The Committee had had the question before them more than once, and he had no doubt they would yet have to return to a charge for inspection. He did not think the Mayor's argument about the price of coal should frighten them. They had contracts entered into for some time to come, and if coal did go up largely they might ultimately have to raise the price of gas. In his opening remarks he was careful not to anticipate any increased consumption, but to go upon the figures of last year. He hoped the amendment would be lost by a large majority.

Mr. JOHNSON then listened to the Mayor with very great pleasure, and thought what an old Tory they had as Mayor for once—ignoring those Free Trade principles that he and a great many others had prided themselves upon for years; and he (Mr. Johnson) became more confirmed when the Mayor began to quote the late Lord Derby. He would take a Radical stand, and would not interfere with the Hon. John Bright's decision, and in his opinion very properly—indirect taxation. It was, however, left for the Mayor of Rochdale to justify indirect taxation. Whether the Right Hon. John Bright's or the Mayor of Rochdale's theory was right the vote that morning would, he said, decide.

Mr. JOHNSON made further remarks, the amendment was put, and lost by 22 votes to 7.

The Mayor then proposed another amendment, as follows, which was, to assist the Finance Committee to get the money in:—*"That the minutes of the Gas Committee now read be approved, except the words referring to any reduction in the price of gas; and that in lieu of the proposed reduction in price we allow 3d. per 1000 feet extra discount for prompt payment."*

Mr. TAYLOR seconded this amendment.

Alderman TWEDALE said there would not in most cases be a sufficiently large consumption of gas in the summer months to induce people to pay promptly.

Mr. PETRIE said the amendment was not right in principle. If they had a sufficient discount to secure a proportionate charge between large and small consumers, it was quite sufficient. The present discount was enough to induce people to pay promptly, at least he judged so from the large number of people that crowded to the office two or three days before the time expired.

Alderman SIMPSON said he should have thought the opponents of the previous amendment would have accepted this with unanimity, and he hoped the Chairman of the Committee would accept it as an amicable settlement.

Mr. PETRIE said if the minutes were adopted he would promise to bring the whole subject of discounts before the Committee.

Mr. BRIGHT thought such a proposal ought first to be ventilated in committee, and

ultimately the amendment was lost, 10 voting for it and a considerable majority against it.

Mr. PETRIE then, replying upon the original motion, said he wished to speak upon a point raised by Alderman Littlewood and others, who understood it had been stated that, if this reduction of 3d. per 1000 feet in the price of gas were made, the next year the gas would be equal to a 5 per cent. surplus, because they would not have allowed a sufficient amount for depreciation. This was not so. Those gentlemen who made the statement forgot that though the Committee had not taken off an extra amount for depreciation for the last two or three years, they had practically been going that direction. They had the sum of £5000, £5000 and £8000 which had been put to revenue account, but which under the old system would have been put to capital account. So it was practically an additional depreciation.

The minutes approving the reduction in price were then adopted.

AMERICAN GASLIGHT ASSOCIATION.

[From the "Official Report" in the *American Gaslight Journal*.]

(Continued from p. 819.)

Following the discussion of Mr. Perstall's paper on "Stoppages in Ascension-Pipes," General Hicklenoper read his paper descriptive of "Rosa's Steam Stoker," an illustrated account of which appeared in the *Journal* the week before last, on pp. 855-6.

The President having invited remarks on the subject of the paper,

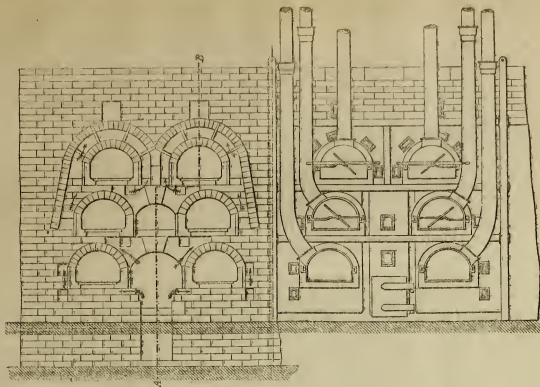
Mr. FOWLER said he had studied the question of steam stoking, and so had the Manager of his works, with the result that four of Rosa's machines had been ordered by them.

Mr. HELME said the first time he saw the machine he was impressed very favourably by it. He thought, however, with it, as with every other new machine, some little improvement could be suggested. The only real difficulty, he said, was that it could not be made to touch to allow of small companies using it. He thought General Hicklenoper spoke about six benches. This would be about 30 retorts. He did not doubt that the machine could be used with advantage in that case, because one or two of the benches would make up the time lost by the others. With, for the reason that it would not be necessary to charge so rapidly as with a large number of retorts. There were, however, a number of companies working less than 30 retorts, and these might find the machine expensive.

Major DRESSER said with reference to the time employed in the use of these machines, he was in Cincinnati last spring investigating the subject. He went into the retort-house at old times, and saw on several occasions 18 retorts drawn and charged in 16 minutes. This seemed to be about the rate at which they were generally working, and they only had two men on the machines, and the men opening and shutting the lids, as referred to in the paper.

The President: Did that include the time taken to fill the hoppers?

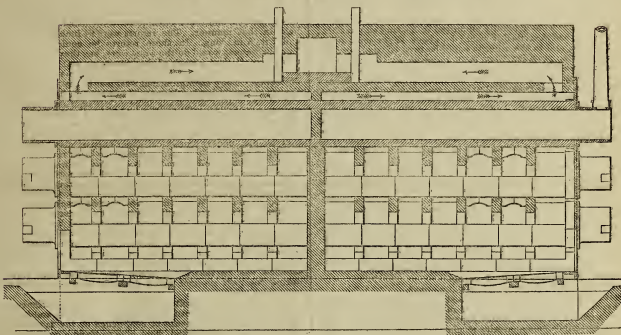
Major DRESSER said it did, because the time occupied by the drawing machine was longer than that occupied by the charging machine. The charging machine could work faster than the discharging machine; consequently the men utilizing the time would be waiting for the retorts to be drawn by filling the hoppers and going ready to go on. The whole thing was regulated by the rapidity with which the retorts could be drawn. When the drawing machine was timed, the whole operation was timed. It was a question for large works whether there could not be some arrangement made by which it would not be necessary to use one charging



CROSS SECTION.

Scale $\frac{1}{2}$ inch to the foot.

FRONT ELEVATION.



LONGITUDINAL SECTION ON LINE A. B.

One of the settings I use, and which has been in use, with some slight modifications, for a long time, consists of two D-shaped retorts, 21 in. by 15 in., and one larger retort 6 ft. by 20 in. This setting carbonizes 7 cwt. of coal in four hours, or 42 cwt. in 24 hours; and taking the quantity usually reckoned of 10,000 cubic feet per ton, the make of gas is equal to 21,000 cubic feet in 24 hours. Assuming the large retort to be equal to two of the smaller ones, it would give 5250 cubic feet per mouthpiece in 24 hours. I consider such a setting of brick retorts to be equal in capacity to a setting of four clay retorts, and I will now compare a setting of each class as to cost and capabilities.

A setting of brick retorts of this class will cost, from the foundations to the hydraulic main complete, about £100, and will last for some 16 years. During the spring of the present year I took out some which had worked for 18 seasons. The cost of repairs will be about £6 annually; therefore these retorts would cost, say, £150 during their lifetime. They would wear some seven or eight months each season, and would in that time make about 4,725,000 cubic feet, or about 89 million cubic feet of gas in their lifetime, which is approximately equal to 0·6d. per 1000 cubic feet as the cost of retorts. A set of four clay retorts equal to these in capacity would cost about £50 when new, and the repairs would cost about £26 every two years, on the supposition that the retorts would last two seasons, and to repair them after one season's working and to replace them every second year. This would give us £26 as the cost of clay retorts for the same time as the lifetime of brick retorts, and taking 80 million cubic feet of gas as in the former case, we arrive at 0·36d. as the cost of retorts per 1000 feet, which is 49 per cent. more than the cost of brick retorts.

The quantity of coke used in these brick retort furnaces is about equal to 6 cwt. per ton of material carbonized. This, to my mind, is rather a large quantity, and I am endeavouring to reduce it somewhat, and have no doubt that I shall succeed. We have used two lengths of fire-bars, each 2 ft. 8 in. long and four bars in width. I have reduced the length of bars to 4 feet, and find a less consumption of fuel, while the retorts seem all the better for it. Possibly the consumption of fuel in clay retorts may be somewhat less than in brick ones, but of this I have no definite information.

The accompanying engravings represent another arrangement of brick retorts which I have adopted to some extent at Oldham, and which I purpose using more extensively as occasion serves. The retorts are built up

of fire-bricks, tiles, &c., as represented. I may, perhaps, just explain the mode of conduction of the heat from the furnace to the retorts. There are six retorts, each 21 in. by 15 in. and 10 feet long, set in three separate heights of two on each height, the furnace being in the centre at the bottom. A portion of the heat from the furnace passes underneath the bottom retorts, and finds its way into the side flues; while another portion of the heat passes over the top of the bottom retorts, and underneath the middle retorts, and finds its way also into the side flues. From these flues the heat disseminates itself partly over the top of the middle retorts, and underneath the bottom of the top retorts, and partly up the outside of those retorts. The heat is then conducted by means of longitudinal flues backwards and forwards along the top retorts until it arrives in the centre flue at the top, whence it is conducted to the flue in connection with draughts in connection with this setting, but not with the same success as with the arrangements which I have just attempted to describe.

A setting of these retorts will carbonize 12 cwt. of coal in four hours, or 72 cwt. in 24 hours, and taking 10,000 cubic feet per ton (as before), they will make 36,000 cubic feet of gas in 24 hours, or about 130 million cubic feet per lifetime. These retorts cost about £150 per set, and assuming that they cost on an average £9 per year for repairs—though I think it will, if anything, be rather under this—they would cost, say, £274 for their lifetime. Therefore 130 million cubic feet of gas being the quantity made lifetime would give us 0·506d. per 1000 cubic feet as the cost of retorts. The quantity of fuel burned in 24 hours at one of these furnaces is 20 cwt., or equal to about 5½ cwt. of coke per ton of material carbonized. This I am endeavouring to reduce, but with what success I cannot yet say.

A set of six clay retorts would probably cost about £100, and two years cost of repairs would be about £35, assuming, as I did before, that new cost of repairs would be required every second year. Then taking 130 million cubic feet, the make of gas as in the former case, the cost per 1000 cubic feet for retorts will be 0·7d.

I feel very diffident in expressing an opinion as to whether clay or brick retorts are best; I would prefer that you should draw your own conclusions on this point. I have simply tried to institute a comparison between the two; the information as to brick retorts being from my own practical experience, that relating to clay being as near as I could estimate from information I was able to obtain. If I am not strictly correct in my

figures under this head, perhaps some of my friends who use clay retorts will set me right. Although brick retorts may not be so extensively used as clay retorts, still I consider they are good, strong and serviceable articles, and will continue to be used for a long time to come.

Discussion.

Mr. J. PARNSON (Warrington) said he could only express his satisfaction and say he thinks to Mr. Chawick for his excellent paper, which brought before them a matter of very material importance. It was not by any means settled which was the best form of retort, whether brick or clay. He had not had any experience with brick retorts, and his belief had hitherto been in the building of them they were met with one great advantage, the increased number of retorts upon which the carbon would deposit itself. This was, perhaps, the strongest argument that he could use against brick retorts. Mr. Chadwick did not, however, refer to the matter, and he (Mr. Paterson) presumed he did not feel oppressed with these deposits of carbon. As to the process of setting the retorts, that was again a matter of great importance, and one which he dared say they all, to some extent, differed in opinion. Probably the process adopted by Mr. Chadwick was one which would find many imitators. He thought it was a very good system. There was no doubt that the construction of the flues was an improvement. The object was to obtain to the utmost extent the same number of flues upon which the combustion of the coke, and from the quantity of coke used by Mr. Chadwick he seemed to heat his retorts in a fairly economical way. He should suppose that the coal used by Mr. Chadwick produced a very fair coke, or he could not have been so successful.

Mr. T. NEWBOME (Manchester) said that the subject of retorts was of the greatest interest to them as gas managers. The question of brick versus clay retorts was one to which he had given some attention, and the conclusion to which he had arrived was that there was no particular advantage so far as these points were concerned, on either side, and that no superiority could be claimed for either brick or clay retorts; and the opinions expressed by the author of the paper confirmed him in this view. In speaking of brick retorts he wished to be understood as referring to brick retorts of the ordinary size, say from 18 to 24 inches in width, and 24 to 30 inches in height, and 10 inches in depth. He never wider, which were sometimes employed, and to which he had a strong objection. It appeared to him that the only points to be determined in making a comparison between brick and clay retorts were as to their relative durability, the cost of their renewal and maintenance, and the full quantity of coke which they would burn. He had made out for himself by Mr. Chadwick in his excellent paper, and certainly he had made out a good case in favour of brick retorts. The fuel account was in excess of what was, or what ought to be generally employed in heating clay retorts; in the one setting he had described it would be about 45 per cent. of the coke used, and in the other setting it would be about 35 to 40 per cent. In working clay retorts, provided they were properly set, the consumption of coke came considerably below the lowest of these figures, and it would have been proper, in estimating the cost of the brick retorts, to have taken the difference in the cost of the fuel, and added it to the cost of the retorts, and then the comparison would have been much fairer than the one which had been made. Mr. Chadwick, however, explained that he could not make this comparison from his own practical experience, and therefore it had been omitted. There could be no doubt that the periodical and frequent renewal of brick retorts was an intolerable nuisance, and of which it would be glad to get rid of in some way or another, and if the quantity of fuel employed in heating brick retorts could be reduced to a reasonable percentage, he was strongly disposed to believe that these retorts would generally come into use, and that it would be desirable they should do so. There was less objection to them now than there was at one time, and they were made about 4 inches or 4½ inches thick, and the quantity of fuel required to heat them was excessive. He wished Mr. Chadwick had entered a little more into detail as to the thicknesses of his bricks and tiles. He believed that brick retorts could now be made as thin as clay retorts, and this being so he did not see why they should be considered as having any difficulty in reducing the fuel account. He should also have been very much pleased if Mr. Chadwick had explained how he attached his mouthpieces.

The President: It is shown on the drawing.

Mr. NEWBOME: But he did not explain the method.

Mr. CHADWICK (Leeds) said that he would advocate for clay retorts over either tiles or bricks. The reason of this was that he served his time under a man who made careful experiments on the subject, and demonstrated to his mind the superiority of clay ones. During the time he used clay retorts in his experiments he had a stack of tile retorts by the side, and after a trial of both for twelve or thirteen years, during the last 18 years, but he (Mr. Veveer) would remind Mr. Chadwick that it did not follow, because an apparatus lasted a long time, that it was therefore the most economical. If they could get good gas in a shorter time from retorts which had not so long a lease of life, it might be very much better and cheaper than to have them last a long time, and then to be out of use for a very long time. There was one idea which had struck him, and which he thought perhaps he carried into effect, and this was the advisability of keeping the tops of the retorts cool. At present the coal was spread over the bottom of the retort; the top got hotter than it should be, and the hydrocarbon gases which were in the coal, and which were contained in the top, became decomposed. This was, he believed, the cause of the large deposit of carbon. It would be very interesting if experiments were tried and the effect carefully noted of keeping the tops of the retorts cool.

Mr. H. WOODALL (Leeds) said that he used brick ovens many years ago. Why he abandoned them he could not say, but he never thought, from what other people said than from his own impression. His results were extremely good, and were better than those obtained from similar coal at neighbouring works. The life of the retorts was remarkable—12, 13, or 15 years—and Mr. Paterson, of Cheltenham, had told him that there were in use at his works ovens that were 25 years ago. Mr. Livesey, some years ago, set up in one of his houses clay retorts. He (Mr. Woodall) told him he would regret it, and when he paid him a visit twelve months afterwards he found that the clay retorts were being pulled out, and Mr. Woodall said he was going back to the use of brick ovens. He concluded that Mr. Chadwick had overruled the objection of his retorts in putting them down at 0.6d. His experience was that the only cost 0.6d., and this included all operations in connection with erection. The only way to reckon the item was to include all that the work cost. If he had used brick ovens for 15 years, there was no occasion to remove the stand-pipe during that period, and the cost of the stand-pipe would be credited when calculating the cost of clay retorts. Taking it in this way there was at least 3d. per 1000 feet of difference between brick ovens and clay retorts, and this equal to 116,000 feet of gas in each. He did not

think quite so good a value was obtained from brick retorts, and there might be a slight difference in the quantity of coke used in carbonizing. As to the question of coke, he found that this was very materially affected by the number of retorts which they had. If the works were under a great strain, the retorts were used for longer periods at a time, the effect of which was that the oven became worn, and the consumption of coke was increased. All these things needed to be taken into account, and if they were not, it would lead to a difference in the value of the two kinds of retorts.

Mr. J. COCKENOTT (Littleborough) had had some experience of brick retorts. At the time they were working them they thought they were doing excellently if they produced 8000 feet per ton. They worked them, he dared say, for four or five years, and when the retorts were pulled out they were as good as ever they were. The reason they pulled the retorts out was that they could not get them hot; they would have lasted 40 years at the rate they were going on.

Mr. E. LORN (Whitworth) said that at his works they used brick ovens like those on Mr. Chadwick's drawing, and they were carbonizing 42 cwt. of coal in 24 hours, and getting over 10,000 feet per ton. He thought they used a deal of coke to keep the retorts hot—15wt. cwt. per setting, or about 60 per cent. Mr. Chadwick said the cost of the retorts was 48s. at 60s. per ton, but he found that his place the repairs cost double that amount.

Mr. J. CHURCH (Blackpool) said he remembered distinctly that some statistics were furnished in a return which was made to the Institution, which clearly demonstrated that, so far as economy of fuel was concerned, clay retorts had the advantage. He had these retorts set in his furnaces, which were 7 ft. 9 in. wide by 7 ft. 9 in. high, the retorts being set three in a row on one side, and three on the other. They produced 8000 feet of gas, and produced 36,000 feet of gas by the ton. The consumption of fuel varied with the quality of coal used. If Arley Mine coal was used, they got a much harder coke. If they employed soft coke, they necessarily used a great deal more; but if they used the coke from Arley coal, they had a great advantage over the other retorts. He had tried the experiment of keeping the tops of the retorts cool. He (Mr. Church) tried this experiment some years previously, the result being a great diminution in the quantity of gas. Mr. Chadwick did not tell them the quantity of carbon deposited. If he worked his retorts at a good heat, he (Mr. Church) ventured to say that a great saving in fuel would be effected in the quantity of carbon deposited, and with a seal. Considering the space occupied by brick retorts, he (Mr. Church) did not believe they would bear the least comparison with clay retorts.

Mr. G. SMEDLEY (Buxton) said in his old works he had one side of the bench set with brick retorts, and the opposite side with clay retorts, set five by five. The experiment he tried was to have the brick retorts set to have the whole of that side set with bricks. The thickness of the bricks was 2½ inches, and the mouthpieces were fitted on with buckstaves, and held in that manner. The retorts were 24 inches wide, 14 inches high, and 7 ft. 6 in. long. In these retorts he could carbonize 23 cwt. each. The clay retorts would do the same, but he did not know. He had two other stacks of clay retorts as well as those of brick which he had mentioned, and he tried them alternately, but could find no difference. They each produced 8000 feet to the ton, but the bricks had the advantage in lasting longer. They were in use nine years, and at the close of this period they made as much gas as the bricks, and they could wear them for a long time. He was in the habit of cleaning the tops of the retorts cool. A great deal depended upon the quality of the coke used, and the one required scurfing and cleansing as often as the other.

Mr. J. BOOTH (Southport) said that it was only during the last 18 months that he had had any practical experience of clay retorts. For 20 years his experience had been confined solely to brick retorts, and after the clay retorts were set with bricks, he found that the clay retorts were better than the brick. The expense of building in the first place might be a little more, but he found there was a great saving in repairs, and, more than this, his experience of the clay retorts was that they were a prolific source of leakage. When they once became cracked they could never be repaired. His foreman had constantly to go round when the charge was drawn and make good the retorts, and after all he found that the yield from the clay retorts was considerably below what he could get from the brick retorts. As to the fuel account, he did not in brick retorts use much more than in clay retorts. As to the coke used, he found that the coke used in carbonizing was less in the brick than in the clay retorts. So satisfied was he that brick retorts were better than clays, that he had during the past summer taken down 70 clay retorts and replaced them with brick ones.

Mr. A. A. KEEN (Bolton) had had a little experience in connection with the working of both descriptions of retorts, and he could, he said, speak with a certain amount of confidence of the fact that brick retorts, when properly constructed, were able to stand a greater amount of heat than clay retorts. He had used Cliff's ovens, and also Emmott's, and these, if properly constructed, were, in his opinion, a very scientific mode of carbonizing. A great deal depended upon the material of which the bricks were made, and the way in which they were burnt. They ought to be uniformly burnt—not too thick—and a good man ought to be set to work on them. He did not consider that a good brick retort should be more expensive, as regarded the consumption of fuel, than a properly constructed clay retort. It was only where they were badly constructed, and an obstruction was offered to the heat, that more fuel was required. If the edges of the bricks were left protruding, this was no doubt a serious evil, not only so far as the external part of the retort was concerned, but also as regarded the internal portion, and this was a very important point. He did not believe there was anything in the question of fuel, and as to longevity, he did not believe there was any comparison between the brick and the clay retorts. The brick ovens were far more economical in the matter of fuel. Altogether, if the practical man mentioned were attended to—if they were constructed in a proper manner, built on a correct principle, by a practical workman—he thought they would obtain better results from brick retorts than they could with ordinary clay retorts.

Mr. B. ASKREW (Northwich) thought that one reason why clay retorts did not last long was that they were so badly constructed, and that they were not properly expanded and contraction, and he believed that if some means could be devised of setting them so as to allow expansion and contraction to take place, managers would do better with clay retorts than with those of brick. He did not speak from experience, because he had never seen a setting of brick retorts in his life; it was a more suggestion to the works concerned.

Mr. H. A. COLES (Tadworth) agreed with Mr. Church as to the impression conveyed by the paper to which he had referred. He happened to be present when it was read, and the matter discussed. He said, he said, in this subject, perhaps more than any other part of gas management, it is the question of the expansion and contraction of the retorts, and this was the proper thing. He could do his four-hour charges, and work off 64 cwt. of coal in 24 hours, and his results were 9715 feet to the ton. He used a coal which was a very good coke. As to the question of brick versus clay retorts, he had not had any experience, but he had heard of it. He had heard of it from Mr. Paterson that in brick ovens there was more space for the carbon to collect.

Mr. WOODALL said that at Cheltenham 11,000 feet and upwards of gas

were made per ton of coal years ago—long before the days of high yields, which were now so common.

Mr. D. CLARKE (Alderman-elect) thought the object of the Institution had been illustrated that afternoon in the very free and candid discussion which had taken place, and which had elicited so great a variety of opinion. So far as his own experience was concerned, it had, he said, been principally with brick retorts, and in a very great measure on the system Mr. Newbagg, condemned so strongly—the setting jump on Emmott's. His production of gas, however, averaged 10,200 feet to the ton of coal. Brick ovens when properly set had some advantages, but whether they were the best that could be adopted was a matter of opinion. He at one time had four benches of seven clay retorts, but he was so tired of taking them out for alterations that he determined to adopt some other description, and he put in a setting of six brick retorts, the bricks and bottom tiles being 3 inches thick. He had these working side by side with settings of seven clays. The brick retorts were the first that he started, but the clay retorts had been secured more than once, while the brick retorts had not been secured at all. They carbured 42 cwt. of coal in one day, which was equal to 7,000 feet of gas per mouthpiece, with four-hour charges. The seven clay retorts he made do exactly the same quantity of work, so that the six settings of brick were equal to the seven settings of clay retorts. As regarded the fuel employed, he did not know of any great difference in the quantity used, but he did not see why there should be, from the fact that the brick retorts were no thicker than the clays, except where the springers were. From his experience in connection with brick and clay retorts, he should consider that the brick retorts were the cheaper, and that the longer life of the brick retorts, the larger the mouthpiece, and the arched brick came into this, as did also the bottom tiles, and to secure it they had a bar which ran across the top of the mouthpiece, and was secured to the buckstave. They thus dispensed with the front plate.

Mr. WALKER, who desired to add to his previous remarks, said it was very important to know this, because in some places there was an immense plate covering the whole of the oven front, which was most objectionable. The dislike he had to using large brick or tile ovens was, that there was an immense area exposed to the cold air every time the door was drawn open. In the case of the brick retorts, the oven front of this kind was very considerable indeed. The men had to use a rake about three or four times the weight of the ordinary rake, and the work was excessive beyond measure, while it took a much longer time proportionately to draw one of these ovens than to draw the ordinary retorts. The large ovens were not so satisfactory as the brick retorts, and, besides, there being ample space, the inconvenience of the carbon on the side was not felt. He had seen some of these ovens with carbon about 12 inches thick on the sides, and how was it possible, under these circumstances, to have, in an oven of this kind, the temperature which was necessary to distil the gas, and to require a draught of gas, and the use of the large amount of coal which was thrown into one of these ovens at each charge, the extreme depth of the coal, and the irregularity and inequality of the carbonization between the outer and the inner portions of the charge.

Mr. CLARKE said that, as regarded the extra time in drawing and charging the retorts, he must admit at once that it took a man rather longer to draw an oven than to draw an ordinary retort, but at the same time he might say that a man would draw and put in a charge of 7 cwt. of material in ten minutes, so that there was no great objection on this ground. As to the carbon on the sides, he would say that those who had used these ovens knew that there was always a disadvantage where the carbon did accumulate, if it was only because of the extra fuel that was required, and they tried to keep it down as much as possible. He had seen blocks of carbon two feet thick that had been taken out of clay retorts. The coal did not lie very thick in brick ovens, as Mr. Newbagg supposed, because there was plenty of room for it.

The PRESIDENT observed that the discussion had been a lengthy one, and had been productive of great variety of opinion. He had no idea there were so many different views on the subject, and he was glad to see that the Institution so many advocates of brick retorts, and it seemed as if one need not be a stickler for the setting jump, and for the clay retorts. Although the evidence in favour of them was very good and very true so far as it had gone, he did not think it was all the evidence that ought to be given. It had been mainly with regard to the life of the retorts.

As Mr. VEEVERS stated, it did not necessarily follow that length of life meant economy in the use of fuel, and he was glad to see that the men who looked at the question of retort-setting, and this was in relation to the men who had to work the retorts. There was also the question of the quantity of gas which retorts would produce, and further than this the amount of fuel it would take to run the retorts while they were at work. He thought the subject might fairly be divided into these four heads, and it could not be fully considered unless looked at from all these points. Mr. Booth's statement that he had heated brick retorts with a consumption of only 20 per cent. of fuel surprised him. He had no idea of such small consumption of fuel either with regard to brick or clay retorts. The consumption of fuel at the Halifax Gas Works, where they worked as high heats as they could get—was from 26 to 28 per cent. This was for clay retorts, and, with the exception of the single statement of Mr. Booth, it was, he believed, very much lower than any amount of fuel mentioned by Mr. Chadwick, or any gentleman who had used brick retorts. He thought, however, that those who had used brick retorts, by the point of view, experience gained from the working of both brick and clay retorts had shown that the consumption of fuel was less in the clay retorts than in those of brick. He was not saying this without proper reason to Mr. Booth, but as (Mr. Booth's) experience was the experience of one man against many. In a case of this sort he felt the President did not think they were justified in pursuing any system of carbonizing while they had another which would reduce the consumption of fuel nearly one-half. With regard to the question of the quantity of gas produced, he did not agree with Mr. Booth, who, he remembered right, said that brick retorts could produce as much as clay retorts, under the same conditions. The experience of all the men he had ever heard speak on the subject, as well as of those who had written upon it, was opposed to this.

As to the effect upon the labourer, large ovens were undoubtedly a positive cruelty to the workmen. There could be no reasonable justification for the use of an oven that subjected the workmen to such a strain as to practically limit managers to one class of men. A man who was not of a robust constitution could not undertake the work at all, while if they had a reasonable size of retort, whether of brick or of clay, they could extend the area from which they drew their labour, thus enabling them to get a sturdier and better class of men. There was also the question of securing the mouthpiece. Mr. Clarke had shown from his experience that the mouthpieces of brick retorts could be secured with almost as little ironwork as was used in connection with clay retorts; but the drawing before them showed an elevation with an iron front.

The amount of radiation of heat from one of these settings must be something enormous. If they were in a retort-house and walked past a setting, and from the front of this kind, and then past a setting where there was only the mouthpiece of iron, the remainder of the front of the setting being brickwork, they would quickly perceive the difference; and he certainly thought the iron front was objectionable, because it radiated a lot of heat which was wanted for the furnace, and, besides, made the retort-house more uncomfortable for the workmen. As to the question of the cost of the two settings, he could not go into it just then, because he had not worked it out in the way Mr. Chadwick had; but the meeting were indebted to that gentleman for having put on record the views he had, because they would enable members to form some idea of comparison between what they were doing and the results achieved by Mr. Chadwick. This was certainly most valuable information for them all. He should, he added, like to say a word or two more upon the question of large or small makes. This was a subject that was being very much discussed in the JOURNAL, or GAS LIGHTING, and some worthy members of the profession were differing as to what was right and what was wrong. This question formed part of the subject of retort-setting. There was no doubt that the retort-house formed the basis of their success, and much of their success, whether it were an infallible test or not, would depend upon the way in which the retort-house was managed. There a man might himself get great injury by trying to get a large yield of gas per ton, and throwing away more money than he could obtain from what he put into the gas, was no doubt, a fact. Many managers had done so, and it could easily be done again. Still he thought there was a reasonable limit to which he could go, and he also did not think it was a question of what was said to the contrary, that any increase in the quantity necessarily meant deterioration in the quality of gas. He believed it was possible to make worse gas with 8,000 feet per ton than with 10,000 feet, from the same coal, because if they had a light yield per ton of coal it was accompanied by a corresponding increase in the weight of the gas. Mr. Chadwick had said, then, to be asked was what the increased quantity of tar was composed of. It was composed very largely of those hydrocarbons which it ought to be the aim of every gas manager to retain in the gas. He believed there was a reasonable limit to which a man might aspire, and up to that he thought it was a question of what was right and what was wrong. The question of yield of gas at a low cost, comparatively speaking, was the best one under any set of conditions, and they must not lose sight of this, whether the retort lasted twenty or only two years.

Mr. CHADWICK, in reply, said he did not think the deposit of carbon inside a brick retort was any more than it was in clay retorts, and he was not of the latter description which he had seen. He had brick retorts which had been working since June, and they had not had anything done to them in the intervening period, except just cleaning the mouthpieces. As a rule, it did not become necessary to remove the carbon from the mouthpieces of the season's work, or from the front of the retort.

Mr. PATERSON: What pressure have you?
Mr. CHADWICK said he had as nearly as possible a level gauge within the hydraulic main. The deposition of carbon was not at all great. Mr. Paterston had asked him whether more fuel was used in heating brick retorts than in heating clay retorts, and he said that he had used the first season of working. He (Mr. Chadwick) found very little difference. He had tried an experiment with reference to this point during the past month, and he found that about the same quantity of fuel was used in a retort-setting which was in its first season, and one which had been in corresponding years. Mr. Newbagg asked a question as to the fastening of the mouthpieces. They were fastened with bolts going through the front plate. The bricks used were 3 inches thick, except in the springer next to the furnace, which was about 1½ inches thicker. The bottom tiles were also 3 inches thick. Mr. Veevers said something about the length of time a retort should last, and he calculated that he took both brick and clay retorts as working the same period each season. Mr. Woodall mentioned the fact that in his (Mr. Chadwick's) comparison he had not taken credit for some little advantages in favour of brick retorts. He certainly had not taken these into account, and when added to his figures the result would be that the brick retorts of the brick retorts of Mr. Cockcroft had told them he could not get more than 9,000 cubic feet of gas per ton of coal from the brick retorts which he had had in use. He (Mr. Chadwick) should never use those retorts if he could only get 9,000 feet with them. He had an average of over 10,000 feet. There must have been something wrong with the retorts of Mr. Cockcroft's retorts, or otherwise he would have produced more gas.

Mr. COCKCROFT: They were 5 or 6 inches thick.
Mr. CHADWICK said the quantity of coke which Mr. Lord used was excessive, and the cost of repairs he had set at double what he (Mr. Chadwick) had set at. He was not going to give any figures as to the expenditure of the last twelve months. Mr. Chew spoke of the consumption of fuel. Mr. Chew's consumption of fuel with clay retorts was certainly less than his (Mr. Chadwick's) with brick; but he had hopes that he should be able to reduce the fuel. He was using fire-bars which were 6 feet long, but was reducing the length, and found he could reduce the quantity of fuel considerably; instead of using 10 per cent. he should be able, he thought, to reduce it to 30 per cent. The back part of the bars sometimes became bare, and allowed a large inrush of cold air, which was very detrimental, and by shortening the bars he should be able to remedy this.

Mr. W. A. WALKER (Elland) read a paper on
TOWER SCRUBBERS.

At our last meeting, Mr. Harrison Veevers kindly put before us some facts of the working of the tower scrubbers of Messrs. Kirham, Hulet, & Chandler. My experience having been confined exclusively to tower scrubbers, I propose to lay before you a few of the results that have followed upon the erection of a pair of this description at the Elland Gas Works.

My first object is to describe to you the arrangements previously existing for the extraction of ammonia at my works. Before doing this, however, permit me to state that our maximum winter's make per day of 24 hours has not yet exceeded 200,000 cubic feet. The scrubbers we had previously in use consisted of two cast-iron vessels 16 feet high by 8 feet diameter, and had a capacity of 1,000 cubic feet. The scrubbing material for every 1,000 cubic feet of gas made in 24 hours; or, if I may so describe it, the gas was allowed to remain in contact with the scrubbing material 1½ minutes. I suppose it is an open question, and I believe a great diversity of opinion exists, as to the exact amount of scrubbing capacity it is desirable and economical to employ; however, about the middle of the year 1878, my Directors having in view the increasing value of ammoniacal liquor, decided on taking a rather long stride, and unanimously resolved on the erection of a pair of tower scrubbers 45 feet high by 9 feet diameter. This gave me 944 cubic feet of scrubbing material for every 1,000 cubic feet of gas made, and allowed the gas to remain in contact with the material 13-74 minutes. Doubtless you will put this down as a very long jump indeed. However, about the month of November, I think it was, in 1878, the scrubbers were in complete working order, so that I can give you the results of one full year's working—that for the year 1879—and place

them in comparison with a statement of the results obtained during an average of, say, the three preceding years, 1876-8. I may first of all mention that the scrubbers are filled with wood boards $\frac{1}{2}$ -inch thick, on the Livesey principle, placed $\frac{1}{2}$ -inch apart, and crossed alternately every tier. The average quality, then, of ammoniacal liquor produced per annum for the three years mentioned, amounted to 24 gallons of 10-oz. liquor per ton of coal carbonized, and the cost of purification, including lime and labour, for the same period, was 0-57d. per 1000 cubic feet of gas made. The quantity of ammoniacal liquor produced for the year 1879 was increased from 24 to 39½ gallons of 10-oz. liquor per ton of coal carbonized, and the cost for purification was reduced from 0-57d. to 0-45d. per 1000 cubic feet.

Now as to the money part of the question. The net gain, after making deductions for the increased quantity of coal carbonized, and for some additional price obtained by the sale of the liquor, amounted to £250 for the year, and though apparatus of that description is of a somewhat costly character, I hope to be able to report to my Directors, in May, from four to five years time, that the scrubbers have paid for themselves. Since their erection I have worked them in various ways with a view to discover the best means of utilizing them as far as possible for eliminating not only the whole of the ammonia, but also as high a percentage as possible of the foul gases, and so reducing the work to be done by the purifiers proper, and I find that by pumping over in the first scrubber, and running pure water into the second one, I obtain the best results.

Very recently I determined to discover exactly what was to be gained by pumping, and for this object I made a description of the scrubbers to be run through the scrubbers, and ceased pumping for several days. The contract being for liquor of 5° Twaddell, I, of course, had to regulate the supply of water so that the issuing liquor should be of that strength, and I found I attained this, and was able to run through the scrubbers 20 gallons of pure water per ton of coal carbonized, and the result was, viz., the condenser, &c.—12 gallons per ton of 5° Twaddell was produced, making in all 32 gallons. I found that upon this plan I could purify the gas made from 48 tons of coal by one ton of lime, and in an analysis of a sample gallon of the liquor produced in this way the constituents I found were found to be as follows:—Ammonia, 136·4 grains, or 6·07 lbs. per ton of coal carbonized; carbonic acid, 31·29 cubic inches per gallon, or 6·06 lbs. per ton of coal; and sulphuretted hydrogen, 400·64 cubic inches, or 7·41 cubic feet, per ton of coal. The total quantity, therefore, of foul gases eliminated amounted to 66·61 cubic feet per ton of coal. I then proceeded by my usual method of working, viz., running clean water through the second scrubber and pumping it through the first one in combination with the condenser liquor. I then found I was always able to maintain the strength of my liquor at the requisite 5° Twaddell, and admit at the same time 28 gallons of clean water into the scrubber, and that with 32 gallons of water I stated was produced from other sources, I found myself with a total quantity of 60 gallons of 5° Twaddell liquor per ton of coal carbonized. I also found that with one ton of lime I could purify the gas produced from 70 tons of coal, and the constituents of a sample gallon of this liquor were found to be as follows:—Ammonia, 116½ grains per gallon, or 6·06 lbs. per ton of coal; carbonic acid, 30·84 cubic inches per gallon, or 6·05 lbs. per ton of coal; and sulphuretted hydrogen, 498 cubic inches, or 11·29 cubic feet per ton of coal, making a total quantity of foul gases eliminated 99·58 cubic feet per ton of coal, or a gain over the previous method of working of 0·53 lb. of ammonia, and of foul gases 30·97 cubic feet per ton of coal carbonized. The results, in my mind, prove conclusively that with a sufficient capacity of scrubbing material, and the liquor made to do the full amount of work of which it is capable, a very great deal may be done towards the complete purification of gas.

My valuable paper read by Mr. Frank Livesey before the British Association of Gas Managers in 1878, I find it stated that every ounce strength of ammonia in the liquor should show, if entirely combined, some 416 cubic inches of foul gases. This, of course, for 10-oz. liquor, would be 41·6 cubic inches. You will have observed that the total quantity found per ton of coal in the sample was 66·61 cubic inches per gallon, so that, in the ordinary way of working, I cannot expect to do much more than I am now doing.

I think this is a subject worthy of our best attention as gas managers, especially having regard to the high prices that can now be obtained for ammoniacal liquor throughout the country.

With regard to the matter of complete purification in closed vessels, I should be much pleased if one or other of our members would give us a paper on the subject at an early future meeting, as it is a matter of such great and interesting character. Doubtless if purification could be economically accomplished in this way, it would be a relief to our gas managers generally as a very great boon; and when we come to consider the talented men who are making this subject their special study, I think some, if not all of us, will be privileged to see it *un fait accompli*.

Discussion.

Mr. CREW said he did not know what kind of coal Mr. Walker used, but evidently it was a coal which contained a very great deal of ammonia. In making a comparison on this subject, one of the first questions to be considered was that of coal. He used two 35-feet scrubbers and clean water, but he did not think it much better than the results he had obtained, so long as they took out the last trace of ammonia. If they took out all the ammonia that was in the gas, and used it in scrubbing or washing to absorb the carbonic acid and sulphuretted hydrogen to its fullest extent, they could not do more. As to the amount of liquor, this, of course, depended upon the quantity of water used, and the quantity of gas, and the quantity of ammonia in it. Mr. Walker said a good deal about the purification of gas. It had been put forth by the late Dr. Letheby that there was no better means of purifying gas than by washing it with strong ammoniacal liquor, and he was no doubt that it would extract the sulphuretted hydrogen and carbonic acid. Ammonia was a very good solvent, and the gas which it could possibly have, if they had only enough of it; but, unfortunately, they had not. He could only say he was surprised at a yield of 39 gallons of liquor to the ton of coal; it was something he had never heard of before.

Mr. PATTERSON was not sure that the quantity of liquor depended at all upon the coal used. His experience with coal was rather against this, and whatever class of coal it was, they would not find very much variation in the quantity of tar or liquor produced, provided the coal was distilled at its proper temperature. He took it that whatever excess in the quantity of liquor had been obtained by Mr. Walker was due to the water used altogether. He used, in fact, a large quantity of pure water, and by this means increased to a very large extent the quantity of liquor. There was no doubt that by using a smaller quantity of water, or using nothing but water, he would get the specific gravity to something like 12° or 14° Twaddell. He did not do this, but he had a very good reason for not doing so, which gave liquor at 5° Twaddell. It was simply a question of taking out the whole of the ammonia from the gas, but on any other principle they would probably not do so; and it was advantageous to do it, not only because of the value of the ammonia, but to save the purifiers for other purposes.

The purifying materials which they had would not tell upon ammonia, and to take out the whole of the ammonia before the gas went into the purifiers was certainly a point which required consideration. The large quantity of 40 gallons was certainly beyond all previous experiments, but he should not call in question the accuracy of Mr. Walker's observations. He was sure that Mr. Walker was right, and he would do it.

Mr. NEWBERRY said he had listened with much satisfaction to the paper read by Mr. Walker, because it bore out views which he himself entertained, and also because it agreed with his own experience of tower scrubbers. The object intended to be accomplished by the scrubber as originally introduced was the extraction of the ammonia impurity from the gas. This work the tower scrubber—if made of the proper height, filled with suitable material, and supplied with a good water distributor—did most effectually. But it would be admitted without question, now that the functions of the apparatus were better understood than was the case when it was first introduced, that it was an inefficient and unsatisfactory scrubber which would not also, in addition to taking out the ammonia, arrest a very considerable proportion of the carbonic acid and sulphuretted hydrogen. The process was, as they knew, a chemical one, so that it was not correct to say that the chemistry of purification began in the lime and soda purifiers. The ammonia combining with carbonic acid formed carbonate of ammonia, and with sulphuretted hydrogen sulphide of ammonium. A good scrubber materially assisted the purifiers. It was sometimes objected to tower scrubbers that their height was objectionable. At the last meeting some of their members congratulated themselves on being able to put their scrubbers under cover. In his opinion, however, the height of the scrubber was its greatest recommendation, because it admitted of almost unlimited surface with the least possible expenditure of ground space. If the water-distributing apparatus at the top were covered, and the precaution taken that the water entering was covered, it was, as it were, a self-sealing cover. The surface of the quired in any scrubber whatever its form, as a matter of fact, they knew that the temperature of the gas was not affected to any appreciable extent in passing through the tower scrubber, even in the coldest weather. On the question of cost there was a positive advantage, in his opinion, in adopting the tower scrubber. The tower cost from £30 to £1000 per million cubic feet of gas per day, and if it was taken into consideration that a minimum of power was required to work the distributor, it would be found in all respects the cheapest and most desirable form to adopt. A moment's consideration of the question would show the marked superiority of the tower over any other form of scrubber that could be named. The water entered at the bottom of the tower, and the gas was forced down over and amongst the filling material. Every single particle of water which entered the vessel formed its share in the work of purification. And not only so, but every drop was being constantly broken up and made to present a fresh surface to the passing gas, and further the whole of the water contained in the scrubber came into contact with the gas at the moment it entered at the top to the time it made its exit at the bottom. For these reasons there need be no surplussage of water, and the resulting liquor was of the greatest strength attainable, and in that condition exerted a powerful influence in arresting the other impurities. The chief point to be observed in the construction of the tower scrubber was that it was filled with coke or boards, or other material, were to be careful that the whole of the tar was eliminated from the gas previous to the gas entering the scrubber (and for this purpose a good washer could be employed), and to see that the distributing apparatus was efficient, always at work, and never allowed to remain out of order. There was just one other point he would refer to. The tower scrubber, besides all its other advantages, had a good appearance. Some of these scrubbers, as now designed, were positively handsome, and did not entail increased cost. This would not be worth mentioning if they were not so efficient appliances. On the other hand, some of the squat machines more recently introduced were the very embodiment of ugliness, and surely appearances should count for something, even in gas-works.

Mr. T. B. BALL (Leeds) remarked that as Mr. Walker sold his liquor by the Twaddell standard, the quantity of carbonic acid he got into it did not present a problem. He had to take care that the liquor he sold contained, he would not get 40 gallons of 10-oz. liquor. The strength was fallacious, and was really due to the percentage of carbonic acid which the liquor contained.

Mr. LONN said he had two scrubbers—one 16, the other 40 feet high. The former was filled with coke, and the latter with boards, and the liquor was run through the second scrubber from the first. He had gone through his last year's account and found that he made 35 gallons of liquor per ton. Before the second scrubber was erected, the make was about 20 gallons, and now they had 35 gallons of 5° Twaddell.

Mr. LONN said he had tested his liquor at 5° Twaddell only contained a little over 1 per cent. of ammonia, and in another case he found that liquor giving the same strength Twaddell contained 3 per cent. of ammonia. He thought it was within the reach of all the members to produce 40 gallons of liquor per ton, when they saw that the actual quantity of ammonia was so small.

Mr. CREW had no doubt the scrubber was highly advantageous in reducing the cost of purification. In connection with the scrubber at his works, he said, they used Livesey's washer. Prior to using it, although they had a tower scrubber 60 feet high and a very efficient distributor, they could not eliminate the last trace of the ammonia, but since they had the washer they could not only eliminate all the ammonia, but the percentage of ammonia in the liquor was increased. They formerly obtained only about 25 gallons of 5-oz. liquor, but some little time ago he sent a sample of his liquor to a chemist, who said it showed a larger percentage of ammonia than many samples of liquor of 6° strength. This showed, as had been already remarked, that the other constituents it contained that made Mr. Walker's liquor so strong.

Mr. C. EASTWOOD (Batley) said, in the first place, it was a fact that coal did differ in the quantity of ammoniacal liquor taken from it. He paid great attention to this matter in his experiments with reference to coal and coal seams, and, as the members knew, he gave some of the results in the paper he read at the last meeting of the Association. At his works what water he used above the gas was used in the distillation, and he had noticed that when he took a certain quantity of coal of a different kind to what he had been using, it invariably altered the quantity of ammoniacal liquor produced, and he could quite corroborate the statement of Mr. Ball that the quantity of ammonia in the liquor, as tested by Twaddell's hydrometer, was what it was. He had recently made a contract with reference to his liquor, the contractor wished him to take either the distillation process of testing the strength, or the ordinary Twaddell test. He need not say he chose the latter.

Mr. CREW could bear out Mr. Eastwood's remarks from a test made a day or two before the meeting on a sample of ammoniacal liquor obtained from other works than his own. He had, as he had said, a hydrometer, and what water he used above the gas was used in the distillation, and he found it to stand at 8½, while the liquor made at his own works stood at 6°. When the turbid liquor had undergone filtration it stood at 6°. He thought this showed that sulphuretted hydrogen or other impurities held in solution

must influence the use of the hydrometer as to finding the true value of gas liquor.

The President reminded the members that at the last meeting he said he was surprised that something more had not been said upon scrubbers as an efficient purifying agent. It was exceedingly surprising that Mr. Chaw's paper should say that if they took out the ammonia this was enough. He considered it was not enough. They were not justified in stopping there. If the scrubber could be made to do more, it was their bounden duty to see that it did more. Mr. Walker had shown them that he had reduced the cost of purification 21 per cent.—from 0.67d. to 0.51d.; and this was to say, that where they were spending £900 in purification he only spent £400. This was a substantial result to have accomplished with his scrubbing apparatus; and if Mr. Walker could do this, he (the President) thought they were not justified in not doing it. Mr. Walker not only took out the ammonia, but something more, and on the present system of buying ammoniacal liquor he said. This was not Mr. Walker's fault, nor the fault of the scrubber. His (the President's) own opinion was that it was a very important thing indeed to be able to do so much work with the gas before it reached the purifier, and at the same time to be able to sell the product. The latter would, however, soon be done away with if they all obtained the same results as Mr. Walker. He thought the purchasers of liquor would very soon give up using the hydrometer as a test, but not for the sake of the neutralization test, which simply gave the quantity of free ammonia in the liquor. If the latter were adopted, the results would be the same, and the cost would be very low indeed. Only two tests for ammoniacal liquor had obtained up to recent years—the Twaddell test and the neutralization test. The neutralization test gave the quantity of ammonia in a free state, while the other test gave the quantity in a fixed condition. Mr. Walker had obtained the results of the Twaddell test, and he thought that he could take a rise out of the sulphate manufacturers, much to the advantage of the Eiland Gas Company, no doubt. Mr. Walker had told him what he had been doing from time to time, and he believed that such work could be done by every one, if a similar kind of apparatus was in use, and that a great deal of money might be saved by the adoption of proper scrubbers. He had himself, as they knew, tried one or two kinds of washers. He had a washer in use which, according to Mr. Chaw's standard, was perfection, for it took out all the ammonia, though it would not do anything like what Mr. Walker's ammonia washers did. The results of the Twaddell test were the same, and the quantity of liquor would be pretty much the same from all kinds of coal, if they were distilled at their proper distillation point. This would account for the fact that in many instances there was a larger yield of liquor sometimes because they had distilled the coals all one way, and mixed the ammonia with different washers. He had tried the Twaddell test, and he used the same at Halifax. He (the President) had worked for days and days together on this particular class of coal, and then he had gone on to another West Yorkshire coal, and had found that while the same quantity had been used the liquor had gone up 1½°, and he thought he went to the coal which he had used before, and he found, in a similar way, that the strength of the liquor had dropped 1½°. The coal which Mr. Walker used was, therefore, calculated to produce a low quality of liquor compared with other West Yorkshire coals. It was the Flockton seam which Mr. Walker used, and he did not do a large quantity of impurities. One of the advantages of the scrubber over the washer was the length of time the gas remained in contact. As Mr. Newbigging had stated, it remained in contact the whole of the time from its entrance into the apparatus until it left it. It was a chemical action which went on, and if they expected any combination to take place they must give the gas sufficient time. The gas being of necessity introduced at a low temperature, any chemical action which it was desired to bring about could only take place slowly; it being a well-known law, to which there was no exception, that chemical action takes place slowly at a low temperature, and quicker at a high temperature. They could not, however, introduce the gas at a high temperature, for the reason that the solubility of ammonia in water varied with the temperature of the water in which it was to be absorbed. If they put the gas in hot, they would find that the ammonia flew off almost as rapidly as it was absorbed, and therefore the only alternative that they had was they intended to go to the low temperature. He (the President) and his own opinion was that it could only be obtained in that way. Of course, they could obtain the same result by letting the gas travel a long distance horizontally; but by doing so they occupy a large portion of the site of the works. He did not know how it was that the tower scrubbers had recently been introduced, and unless it was because gas managers were imbued with the idea that it was only necessary to take out the ammonia, and that nothing more was required. His opinion was that they must take out everything they could. There were different kinds of tower scrubbers, and he believed the opinion of many gas engineers had been that they did not take out all the ammonia, and in this respect they might have grown into disfavor; but he thought the tower scrubber would take out the ammonia if it were properly filled, with a proper distributor to keep it in order. It was the duty of the manager to see that this was done. He had gone carefully over this question recently, and he had found that the tower scrubber was his own until Mr. Eastwood visited his works, and said he had had one like it in use for five years, and if he had any prejudice it would be in favour of this machine; but in spite of this he came to the conclusion that the most efficient apparatus was the tower scrubber.

Mr. Chaw told it that it was the ammonia which acted on the sulphuretted hydrogen, and not the water. If there was a large quantity of ammonia, it would, he said, take out the sulphuretted hydrogen and carbonic acid, and it was to be done altogether by the water. This really showed the result to him. The great difficulty with which he met was the freezing of the taps in winter-time. He had not a washing arrangement, but certainly if the gas could be purified in a close vessel which could be kept from freezing it would, in his opinion, be an advantage over the scrubber. The President observed that he did not say it was the water that did the work, but the water happened to be the medium which converted the ammonia. The ammonia existed in the gas in a gaseous state, but he believed that when it was in solution it acted with more effect. It was a question of application, that was all.

Mr. CHAW: The inference you drew from my remarks was the reverse of that.

Mr. WALKER, in reply, thanked Mr. Paterson and Mr. Newbigging for their kind observations in support of his paper, and remarked that Mr. Ball said something about the number of grains of ammonia being less in No. 2 sample than with the clean water process. This really showed him the value of making use of ammoniacal liquor as a purifying agent, for, as the analysis showed, the ammonia was replaced to a certain extent by sulphuretted hydrogen. The coal which he used was, as the President had mentioned, the Flockton seam, and he (the President) had told them the quantities of this gas for river gas. He (Mr. Walker) attributed the excellent results which had been achieved firstly to the amount of scrubbing capacity employed, and secondly to the way in which the liquor

was pumped over, and the manner in which it was distributed through the scrubber. If they took care to maintain at all times a thoroughly wetted surface, and had sufficient capacity, they would obtain the same results. A great deal depended upon the length of time the gas was allowed to remain in contact with the scrubbing material, and if they had a desire to simply take out the ammonia and nothing else, they could do this very easily. He could do it with 20 gallons of pure water per ton of coal; but his object was to purify the gas as far as possible before it entered the purifiers proper. The object of the paper was to show this, and to prove that by efficiently carrying out a greater amount of purification could be done, and the money results proportionately increased.

[Mr. T. B. Ball, of New Wortley, Leeds, had promised to read a paper entitled, "Is the Elimination of Light Oils from the Tar, and their Retention in the Gas, Desirable?" The afternoon gas meeting was adjourned, and the President suggested that, as many members would have to leave before the paper could be discussed, it was desirable to postpone it till the next meeting. This opinion was endorsed by the meeting, and Mr. Ball assented to the arrangement proposed.]

The President then moved a vote of thanks to Mr. Chadwick and Mr. Walker for their paper, and to Mr. Chaw for his paper.

Mr. FRASER seconded the motion, which was supported by Mr. PATERSON, who remarked that the subject with which Mr. Ball proposed to deal was one of very great interest, and the paper would, he hoped, be read at the next meeting.

The President then moved a vote of thanks to the three gentlemen included in it very briefly responded.

A vote of thanks to the President for his conduct in the chair was adopted, on the motion of Mr. NEWBIGGING, seconded by Mr. CHAW, and the proceedings ended.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

THE town of Montrose seems to be in a somewhat excited condition at present, owing to the decision of the Town Council to apply to Parliament for powers to acquire the gas-works. For some reason or other—it is not very obvious from the published reports of the proceedings—an active opposition to the proposed scheme has been manifested, and the burgh, but if the opposition does not speedily resolve into "thin air," its leaders, at any rate, will receive such a check at the approaching poll as will surely carry conviction to their minds that the sympathies of the greater portion of the community are with the Provost and the majority of the Council in favour of the proposed scheme. The Provost, however, has been somewhat disingenuous in his somewhat disingenuous duty has been imposed upon Provost Jaap of rebutting certain misleading statements, and of explaining away a mountain of figures which Mr. Durie, one of the Council, had laboriously piled up to frighten his fellow-townsmen into compliance with his opposition. At a meeting of the Town Council on Thursday last, the Provost, in the presence of the town, with great credit to himself, and I should think, to the utter discomfiture of the ringleader of the opponents of the scheme, Mr. Durie produced figures to show when first the scheme was propounded, some three weeks ago, that the town was burdened with debt to the amount of about £60,000. The Provost proved this to be an exaggeration of nearly £11,000, and then he quietly proceeded to discuss the financial position of the town in the event of the gas-works being acquired. He does not by any means "draw the long bow." In plain figures, he demonstrates that it may be three or four years before the town will begin to feel any appreciable benefit from the proposed change. He then proceeds to explain how to carry out the transfer even on that footing. It is plain that the Provost does not belong to that class of selfish local legislators who think they have sufficiently discharged their civic duties by attending to the immediate present, and who imagine it is adverse to the decrees of Providence to consider the future. He looks hopefully forward to the day when, as the interest on capital decreases, the town will be supplied with gas at a much lower figure than at present. Even taking the most serious view of the position of affairs, he feels convinced that the Corporation would be able to take over the gas-works and manage them in such a way that it would be a benefit to the town. He then proceeds to explain how the "red herring" of electric lighting was drawn across the scene; but it failed of its purpose. I am afraid that if Dean of Guild Scott bases his reputation upon the accuracy of his prophetic utterances, not a shred will be left to him at the end of that period when gas is to be snuffed out. In order that his words may go down to posterity, and that his name may be enrolled on the scroll of Fame alongside those of the great Marquis of Montrose and Joseph Hume, his fellow-townsmen, I here quote them: "There is a great probability that gas as a lighting medium will ere long be superseded, and we should therefore be cautious." He then referred to places where the electric light has been introduced, and in answer to a Commissioner who had dared to say that this light would never be of any use in lighting dwelling-houses, the seutentious Dean observed that these were almost the very words his father had used 50 years ago in regard to the electric light. It is not surprising that the Dean of Guild did not receive his prophetic mantle from his father. But the Dean went a step further than this. Hitherto the most timorous gas director has consoled himself with the fact that if electricity should ever become a competitor with gas for lighting, coal would never cease to be demanded, for the miners' pickpockets are not prepared to lay down the law; but the Dean is of belief "that before the end of the century what they now proposed to pay £25,000 for would not be worth £5." Although this statement was received with laughter, it is very sad. I trust that the Dean will live to see his prophecy turn out incorrect. It is sad, and it is plain that the Provost will be liberally backed by the majority of the community.

A movement has been instituted in Aberdeen, having for its end the establishment of a gas exhibition. As in Glasgow, the originators of the scheme are the members of the Corporation of Aberdeen, and they have secured a guarantee-fund with a subscription to the extent of £50, if the matter should receive the support of the public, and if a good local Committee is formed. This proposal has brought out the fact that on the 25th of October last Mr. Smith, the Gas Superintendent of the City, received a letter from a prominent citizen, offering to get up an exhibition, admission to which should be gratuitous; but this offer is conditional upon the Gas Committee agreeing to supply gas connections. The idea is novel; but I am afraid that in order to make such an exhibition worthy the city of Aberdeen, where a lively interest has always been manifested in matters pertaining to the gas supply, the expenditure would be incurred, and the money which a small charge for admission would almost be necessary. I have no doubt whatever that if an exhibition were got up the Corporation would not only make the connections, but would supply the requisite amount of gas gratis. In doing this a Corporation is only advancing its own interest. It may be that it is eating the "bread upon the waters," but the ultimate result must be substantial gain. All who are interested in gas matters will wish success to the movement.

Within the past week many of the towns in the east and north-east of Scotland have been directing their attention to the question of water supply. Recently ascertained facts go far to show that where there is abundance of pure and wholesome water the source of epidemics is not felt, and that where the supply is deficient and of doubtful purity the health of the community greatly suffers. This has been the case in Edinburgh. I have, in previous communications, shown that, although the water supply of this city is amply abundant, its quality has not afforded that degree of satisfaction which was anticipated. At a meeting of the Edinburgh Water Trust, on Thursday, there were sarcastic references made to "Leslie's tinctor," "Leslie being the Engineer of the works—and "Leslie's compound." In order to quiet people's minds and bring about a better feeling with respect to the water, the Trustees have engaged Professor Crum Brown and Mr. J. T. Buchanan, Lecturer on Chemistry at the University, to analyze samples of the water. Although the analysis may show that the water is wholesome and pure, it will not, for some time at any rate, drive from the recollection of the citizens the pure crystal-like waters which they formerly received from the Crawley Springs. From the proceedings of the Trust it seems that the amount of money borrowed on mortgage since July 30, 1874, under the Acts of 1874, 1876, and 1880, has been £269,830, the amount in the bank is £32,442 12s. 1d., and the amount the Trustees still have power to borrow under the existing Acts is £95,100.

The town of Stirling, which was reduced to such straits during the recent water famine in Scotland, has resolved to be better provided in future for dry seasons. Last week the water committee resolved to proceed with a new Water Bill, and they estimate that the proposed works will cost about £10,000.

Elie is a pretty little watering town in the East Neuk of Fife, and hitherto its inhabitants, as well as the swarm of visitors who flock thither during the summer months, have been dependent on the water supply upon the few wells that are scattered up and down the town. Certain of the residents desired that Elie Liberty and Williamsburgh should be formed into a special supply district; but as the Local Authority refused to comply with the request, an appeal has been made to the Sheriff, who has, in due time, refused the petition. The water committee is now on the side that there was at present an ample supply of water, and on the other that the Local Authority had failed to perform their duty in refusing to form the localities mentioned into a water supply district.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

At the last meeting of the Dean of Guild Court at Govan, a burgh of upwards of 40,000 inhabitants in the south-western suburbs of this city, the plans submitted for approval of the plans of new gas-works to be erected in connection with Messrs. John Elder and Co.'s works at Fairfield, the largest private shipbuilding and marine engineering establishment in the world. The erection of the works, the plans of which were passed, is to be done under the superintendence of Mr. Miller, of Thomson & Co., Govan, who is said to have patented a new process of gas-making by which a considerable saving can be effected. The new works will embrace a retort-house, having two benches of five retorts each, together with a gasholder 40 feet in diameter, and contained in a concrete tank 21 feet deep. It is stated that in this case Mr. Miller undertakes to supply the gas free of charge, his opinion being that by his new process he can utilize the products so as to cover expenses. A claim is made in favour of the process, that from common coal dross or "tripping," 28-candle gas can be made to the extent of 7000 cubic feet per ton. Various other advantages are claimed in connection with it, and it is stated that Mr. Pearce, the enterprising head of the Messrs. Elder and Co., has not only examined the process thoroughly, but that he is convinced of its superiority over the older or ordinary method, and is doing all in his power to give it a fair trial. Unless I am mistaken, this same process was in operation at Messrs. Crum's cotton-printing works at Thornliebank, where it was examined, at the request of the patentees, by some members of the Committee of the West of Scotland Gas Association. Managers within the last two years. When it is in a fair way of working at the Fairfield establishment, I hope to have an opportunity of carefully examining and reporting upon it. Meantime I am not in a position to express any opinion regarding it.

An extensive fire took place last Sunday morning at Lounsdale Bleach-Field Works, near Paisley, the origin of which is stated to have been in a small gas-works connected with the establishment. The damage is said to be about £30,000.

The whole country for the building of the new gas-works referred to last week as about to be erected at Port Glasgow for the purpose of the Clyde Lighthouses Trust, has been secured by a Greenock firm. At the gas-works in the adjoining town of Gourock there are still some extensions to be made. These are now about to be taken in hand.

It seems that the voting of gas profits to town improvements is now exciting attention among the ratepayers of Glasgow. On Tuesday last the subject was taken up and considered at a meeting of the Committee formed to look after municipal affairs on behalf of the Tenth Ward, and after a considerable amount of discussion, the following resolution was unanimously agreed to:—"That this Committee strongly disapprove of the action of the Council in voting gas profits to the use of the Tenth Ward for statute labour purposes in George Square, instead of to the legitimate purpose of reducing the price of gas to the consumers, and that the office-bearers be instructed to communicate with the Committees of other wards with a view to the matter being further ventilated." The agitation thus commenced is, however, of little consequence, as the most influential Ward Committees in the city, may, in course of time, have some influence on the Corporation Gas Commissioners.

So far as Dumbarton is concerned, it is said that perhaps one of the most noteworthy features of the present day is the rapidity with which gas is supplanting coal as the source of heat in the houses of the middle class of that town. Indeed, gas fires, gas ranges for cooking, gas stoves, &c., are all the rage in Dumbarton at present; and so great has the use of these become, that the quantity of gas consumed in the burgh has increased by 100,000 or 150,000 cubic feet in the last year. In one large house in the burgh, coal has all but been expelled; in many others the fire is being the place of coal fires at a rapid rate, and in a sweeping manner, whilst for cooking purposes, heating baths, &c., gas is becoming a universal favourite.

Progress in street lighting is showing itself at Motherwell, the Police Commissioners of that burgh, having at their last monthly meeting resolved that in future, during the lighting season, the streets should be lighted on Saturday nights, irrespective of the moonlight, and that the period every month during which the lamps are not lighted on account of the full moon be shortened by two nights.

Mr. W. H. Prescott, the Engineer for the Port of Glasgow Department, came to Glasgow to-day for the purpose of inspecting the arrangements for lighting up the sorting-room and telegraph instrument-room in the local post office by the electric light. It is reported that the contract for doing the work for one year by Messrs. R. E. Crompton and Co., London, is practically as good as closed. I do not know what the terms of the contract are

to be, but it would be worth while to learn whether or not the work can be done on the new system at the cost of gas. Gramme machines and Crompton's lamps have been used in the experiments.

The pig iron market has fluctuated somewhat this week, and the closing price yesterday was 1s. per ton under last week's closing quotations. Very little change has taken place during the week in the Scotch coal trade. Prices in some districts are decidedly firm.

CURRENT SALES OF GAS PRODUCTS.

A Manchester correspondent, writing on Saturday, said: "Gas products continue firm. Some manufactured tar products are weaker, though pitch is still a good demand." The following are prices realized in actual sales last week:—

Tar.—40s. for town contracts. The price of tar is at present high in proportion to the value of tar products generally. Ammoniacal liquor (sp. gr. 1.035) commands 20s. to 24s. per ton. Ammonia sulphate, white, £18 10s. per ton; grey, £18 10s. to £18 12s. per ton. Ammonia muriate (sal ammoniac), £44 to £45 per ton; white, £31 to £36 per ton; grey, ordinary, £30 per ton. Sulphuric acid (brown vitriol), £28 18s. to £28 19s. per ton (firm). Muriatic acid, £1 5s. to £1 10s. per ton.

THE EXAMINATIONS IN "GAS MANUFACTURE."

In reference to the notice published last week of the examinations to be held next year under the auspices of the City and Guilds of London Institute for the Advancement of Technical Education, we have been asked to give an idea of the kind of questions put to candidates; and we cannot do better than re-produce the examination paper set for the three grades in this year's competition, three hours being allowed for the preparation of the replies in each case. The questions were as follows:—

Elementary.—1. What are the most important considerations to be kept in view in selecting a site for the manufacture and distribution of gas? 2. Describe the best settings of retorts for a minimum daily supply of 15,000 feet of gas? 3. Describe the necessary storage to be provided for gas, the daily supply of 15,000 feet of gas? 4. Describe the settings best adapted for, say, a minimum daily supply of 150,000 feet of gas? 5. What are the advantages in large works to be derived from the use of Great Central Company's through and through retorts? 6. What quantity of gas ought a retort of a given size to produce, and what are the considerations to be kept in view, and how? 7. What are the advantages derived from the use of exhausters? 8. What are the advantages derived from the use of the retorts, and avoiding the possibility of drawing in atmospheric air? 9. Give a general description of a dry gas-meter, and the principles of its measurement. 10. Give a general description of a wet gas-meter, its construction, and the precautions upon which its measurement is based.

Advanced.—1. In estimating the value of coals for the production of illuminating gas, what are the considerations to be kept in view? 2. Is it necessary and always desirable that the storage of gas should be where it is made? In some cases, it is desirable to have a gasholder, or holder, in the works, and in others, it is not. Give reasons for your answer. 3. Describe the extent of storage which ought to be provided for a daily consumption of, say, 300,000 feet of gas. 4. Describe the most approved shape and size of gasholders and tanks, having regard to economy and certainty of action, for a maximum daily supply for, say, 5 million feet of gas, having regard to cost of construction, gasholder frames, and tanks. 5. What are the advantages to be derived from the use of clay and iron retorts in combination, the clay retorts being in two arches surrounding the furnace, the iron retorts being in another arch, as introduced by the Great Central Company? 6. What are the advantages of the red-hot furnace, and of drawing the bars below (as used by the Great Central Company), instead of at the furnace doors? 7. Describe the after-process to be carried out in the purification of gas, having regard to purity, illuminating power, and the value of the residual products—tar and ammonia. 8. Can salts or acids be employed in the purification of gas, and, especially metallic salts? Give the reasons of your answer. 9. In the arrangement of gas-mains in crowded streets, it is desirable to have a main on each side of the street, in the carriage way, or are there advantages in having one large main in the centre of the carriage way, and with small subsidiary mains on each side in the footways, to which the connections of the gas consumers, frames, and tanks, of the Great Central Company? Give reasons for your answer. 10. Is the unaccounted-for gas not due to a large extent to inaccurate registration, stealage, and over-estimating the consumption of gas by the public lamps, and over-estimating the production of gas at the works? Give reasons for your answer.

11. What are the considerations to be kept in view in the selection of a site for the manufacture and distribution of gas? 12. Describe the simplest and most effectual method of clearing mains and services of naphthalene?

Honours.—1. In manufacturing gas from coal, may not the destructive distillation be carried on too far? and quantity be obtained at the cost of illuminating power and the production of deleterious gases? Give your reasons. 2. Does not carbonic oxide gas lessen the illuminating power of other light-giving gases to a greater extent than its own bulk? State facts within your own knowledge. 3. When bisulphide of carbon is formed, why is it difficult or commercially impossible to remove it in the after process of the gas? State your reasons. 4. State the extent to which gas is deteriorated by the admixture of atmospheric air? 5. How much is it lowered, say, by the admixture of 1 per cent? 6. What pressure of gas is required to overcome the necessary friction in its passage through well-arranged meters and fittings, to get a given quantity of gas to the consumer? Give your reasons. 7. What is which is necessary to give a good light, involves a loss to both producer and consumer; why? 8. To what extent is the loss of gas which arises from the action of the forces, exosmose and endosmose, modified by varying pressures? And do these forces act with equal power when the gas is at rest, and when it is in motion? Give your reasons. 9. Do various kinds of coal yield gases differing in their penetrating power; that is, supposing that one description of coal produces gas equal to 16 candles, and another description of coal yields 24 candles, the photometrical observation being made with the lights 100 inches apart, and the consumers in the same way? Give your reasons. 10. Does this relative proportion hold good? Give result of experiments. 11. The leakage of gas has been variously taken at from 5 to 20 per cent. What becomes of it? 12. What is the impure gas that is often found in gas supplied to the public, which, more especially, acts upon the eyes, and causes a redness and irritation of the eyes? Give your reasons. 13. What is that impure gas which is generally, and, in many cases, to a most injurious extent, contained in the gas supplied to the public, and which is not detected by the acetate of lead test, but which produces a choky and deleterious effect upon the atmosphere? Give your reasons. 14. What are the advantages of the use of the windings of books? 15. To what extent can machinery be employed to advantage in lieu of manual labour, more especially in drawing and charging retorts? Can you give any results of the working of Foulis's, West's, or any other system?

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There has been a lull in the demand for the better classes of round coal during the past week, owing to the extreme mildness of the weather, and although in the Manchester district the advances made at the commencement of the month are being maintained, less firmness seems to characterize the upward movement in the Lancashire districts. In the West Lancashire districts any further advance this month has not been general, and in many cases where colliery proprietors have put up their prices they are not disposed to lose orders by holding out for an advance upon last month's rates. The agitation which is now going on amongst the miners in Lancashire for an increase in wages seems to have excited some little apprehension with regard to the future amongst consumers of gas coal, as I hear of private inquiries with regard to further supplies having recently been made from several quarters. In manufacturing classes of fuel there is very little material change except so far as slack is concerned. The advance in the price of this class of fuel which was made in the Manchester district at the commencement of the month, seems to have driven some of the consumers of engine fuel on to burly; whilst in other districts the increased production of slack has caused a slightly easier tone in this description of fuel, and in some of the collieries concessions are being made to secure orders rather than stock. The average prices at the pit's mouth may be given about as under:—Best Wigan Ayr, 9s. to 9s. 6d.; common Ayr, 6s. 6d. to 7s. 6d.; Pemberton four-feet, 7s. to 7s. 6d.; common Wigan mines, 6s. to 6s. 6d.; steam and forge coal, 5s. 3d. to 5s. 9d.; burly, 4s. to 4s. 6d.; and good ordinary slack, 3s. 6d. to 3s. 9d. The coal trade in the shipping trade a moderate amount of business is being done, but sellers find it difficult to obtain any material advance in prices.

Coke continues in fair demand at about 9s. to 12s. per ton at the ovens. The miners in the Wigan, Oldham, and Ashton districts are now pressing for an advance in the price of their produce. In the Bolton district, the men at several of the pits are out on strike.

The iron trade is very dull, and there has been extremely little business during the past week. Local makers of pig iron are firm at their full rates of 46s. 6d. to 47s. 6d., less 2d. for delivery equal to Manchester; and amongst holders of outside brands there is an easier tone, and more disposition to sell for long forward delivery, iron in some cases being now offered at present rates over the first six months of next year. For finished iron there is very little demand, and prices all through are low. Local bars do not fetch more than about 45 lbs. for delivery equal to Manchester, and iron pipes are at 44 per ton, under, and for wrought-iron pipes extreme discounts are now being quoted.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

The tone of the coal market continues firm, although the demand is not so active as it was a month ago. A pretty fair quantity of coal has been dispatched during the past week, and the collieries are busily employed. In some cases there is still difficulty in getting ready tonnage stemmed. Prices have not undergone any material change, but sellers are able to sustain the rise previously noted, and in the very face of the fact that the inquiries from some of the Mediterranean markets are not pressing, there is a moderate improvement in the quantity of coal shipped during the last week, as compared with the previous week, to the amount of 741 tons. The actual clearances at Newport last week reveal a very good total, and also show that the local collieries have been well employed. The firmness of coal prices is well maintained, and it has been in most cases with difficulty that buyers have been able to get their requirements satisfied, unless at an advance. In certain cases sellers are not anxious to add anything further to their stems, although offered an advantage in price.

The iron trade is not in any way less busy than previously reported. Tinsplate are still in a very languid state. In the quantity of coal shipped at Swansea last week there was an improvement over the previous week to the amount of 4819 tons. The steam coal clearances also showed an improvement as compared with those of the previous week; at the same time there were considerable below the average. With a better supply of tonnage a steady weekly increase would be shown. So scarce has tonnage been of late at Swansea that several shippers have been obliged to transfer their orders to Cardiff and Newport for execution. Steel rails show a decided improvement, makers being unwilling to quote for forward orders, at all events not at a discount below the average. With a better supply of tonnage Tinsplate shows no material advance, the same low prices as those previously reported still ruling in Liverpool and elsewhere.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The steady improvement reported in the coal trade in this district continues, and orders are more plentiful with nearly all the colliery proprietors. The increase in business, first apparent in the Cannock Chase neighbourhood, has extended to the various other localities, and the hands are now employed more time than has been known for a considerable period. Prices for all kinds of thick coal are very firm, and it is considered probable that a further increase in rates will be made by leading firms. In making fuel is also more needed, and there is a fair existing demand for gas coals of good quality. Cokes are selling at much the same rates, and, though the coal is good, prices, owing to an abundant supply, are unchanged.

The iron trade is not in any way less busy than previously reported. Tinsplate are still in a very languid state. In the quantity of coal shipped at Swansea last week there was an improvement over the previous week to the amount of 4819 tons. The steam coal clearances also showed an improvement as compared with those of the previous week; at the same time there were considerable below the average. With a better supply of tonnage a steady weekly increase would be shown. So scarce has tonnage been of late at Swansea that several shippers have been obliged to transfer their orders to Cardiff and Newport for execution. Steel rails show a decided improvement, makers being unwilling to quote for forward orders, at all events not at a discount below the average. With a better supply of tonnage Tinsplate shows no material advance, the same low prices as those previously reported still ruling in Liverpool and elsewhere.

YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The most important feature connected with the coal trade of this country during the past week has been the consideration of the Employers Liability Act, and the attempt to come to some understanding respecting

its working. A large meeting of West Yorkshire miners has been held at Castleford, at which Messrs. Pickard and Parrott, the miners' secretaries, advise the men not to contract themselves out of the Act. Similar advice has been given by Mr. Frith, the South Yorkshire miners' agent, and at a meeting held at Wombwell it was resolved not to interfere with the question until after the National Conference to be held in January next.

The business in steam coal continues dull, although the exports from Hull, Grimsby, and Goole are favoured by the open weather, some of the northern ports not having yet closed. The week has been a memorable one, owing to the rapidity with which the shares in the new Hull and Barnsley Railway and Docks have been taken up. Although the line does not reach Barnsley, and some of the pits are not approached in a direct form by it, still it is believed it will act as a great boon to the South Yorkshire steam collieries, particularly during the winter months, when the hard coal has to be stacked on the pit's bank in order to get house coals.

Throughout both districts other kinds of fuel are not over active. Manufactured coal is easy to procure, and at some places the coke trade is only moderate. The chief demand for the South Yorkshire coke is that of smelters in North Lincolnshire, where trade continues pretty active.

The steel trade is a whole, presents a healthy and active aspect. The works at Penistone are fully employed, and it is understood, will be until the Christmas holidays set in. Pig iron is still largely produced at the furnaces at West Ardley, Milton, Eilescar, Thorncliffe, Parkgate, and other places, nearly the whole of which draw their supplies of ironstone from North Lincolnshire. The foundries, with few exceptions, are badly off for work.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The gas coal trade is as active as has been the case in any November and December over the past three or four years. The pits are working full time, and there are no stocks. As handy steamers have come out of the Baltic into the coasting trade, the supply of tonnage is ample. The shipments of gas coals were hardly so good as in the previous week; but the previous week's shipment of coals from the Tyne Dock was the largest on record—viz., 110,000 tons. As the larger portions of the gas coals placed on board steamers last week were to send coastwise, the home demand was fully met. There are not any reports of long contracts having been made. Most of the business which has been done has been for supplies not to exceed twelve months. Prices are unaltered.

The transference of second-class gas coals into the house trade is stopped, as it has been found that the latter market cannot be forced beyond a certain point. The demand for Durham manufacturing coals and also for coke has been strong during the long time, coke being much required, not only in the Cleveland iron district, but also for the West Coast and North Lincolnshire. Manufacturing coals are fully 6d. per ton higher than at the beginning of the month, and the general price of coke at the ovens for blast furnaces is 10s. to 10s. 6d. per ton. Contracts have been made for the higher qualities of coke for locomotive and other purposes, to be delivered over next year, at a slight advance in price. The business doing in steam coals is better than in the corresponding month of last year.

The sailing tonnage employed in coasting met the requirements of Merchants and gas companies last week, and freights to the Channel, Eastern Counties, the North of France, Ireland, and Scotland did not advance. At the same time there was no urgency on the part of the colliery offices in the engagement of more sailing vessels or steamers to load gas coals. Rates were unaltered.

The iron trade of the North of England is in a pretty sound condition. The finished iron is still improving, and manufacturers of plates and angles are nearly fully booked for four or five months to come. The ironfounders continue to do better. It is believed at Middlesbrough that a brighter time is dawning once more for the engineering and ironfounding branches there. The foundries on the Tyne are especially busy in the manufacturing line.

There is nothing special doing in the fire-brick or fire-clay trade generally. As most of the second-class factories have transacted a somewhat unprofitable trade this year, they are careful not to accumulate stocks over the winter. The chemical market improved last week. The demand for soda ash was very brisk, and there was an advance in the price of soda ash and bleaching powder. The demand for cement is quiet, and the lead trade is dull. Only a very ordinary business is transacted in woods of all kinds, and there is no advance in prices.

At the Glasgow Philosophical Society's recent exhibition, a first-class certificate (the highest award) was received by the Waste Water Meter Company, Limited, of Liverpool, for their exhibit of Deacon's waste water meter.

M. ADER, says a foreign contemporary, is attracting much attention in France by his new process of converting iron into steel, and producing an illuminating gas by the process. The iron is heated to 900° C. in a retort with coke or charcoal. Fatty matters are then injected, and dry steam forced over the heated mass. This steel of high quality is formed, and carburized hydrogen gas evolved.

THE NEWBURY CORPORATION NEW GAS-WORKS.—These works, which have been carried out under the superintendence of Mr. J. G. O'Farrell, have now been practically completed, and are to allow of the manufacture of gas at them during the past week.

DINNER TO THE EMPLOYEES IN THE NOTTINGHAM CORPORATION WATER DEPARTMENT.—Mr. Thomas Hawksley, C.E., who has recently terminated his long connection with the late Nottingham Water-Works Company, extending over 50 years, invited the whole of the employees of the Corporation Water Department to dinner on Friday and Saturday, the 8th and 9th inst. About 80 persons attended the dinner on Friday evening. Mr. Hawksley was unable to be present, but sent a letter to be read on the occasion. The chair was taken by his son, Mr. Charles Hawksley, and the vice-chair was occupied by the late President Engineer, Mr. Henry Rofe. After dinner the Chairman gave the usual loyal toasts. The Vice-Chairman then proposed the toast of the health of the employees. Mr. Thomas Hawksley, which was most enthusiastically received. Mr. Moore proposed "The health of Mr. Charles Hawksley, the Chairman," who replied, and proposed the toast of "Success and Prosperity to the Corporation Water-Works," which was acknowledged by Mr. Moore and Mr. Beardsley. The toast then being "The health of Mr. Rofe," a requested his acceptance of a testimonial—a very handsome clock, with a suitable inscription—which had been subscribed for by the employees as a slight mark of their high esteem and great regret at his ceasing his connection with them. Mr. Rofe suitably replied. A most enjoyable evening was spent on each occasion.

CASTLE CARY GAS AND COKE COMPANY.—This Company was registered on the 7th inst. with unlimited liability, having been previously constituted by deed of settlement, and subsequently incorporated as an unlimited company under the Joint Stock Companies Act, 1856.

ABERDEEN WATER WORKS COMPANY, LIMITED.—A Company under this title was registered on the 1st inst. with a capital of £300,000, in £20 shares, for the acquisition of a concession for the exclusive right of the distribution and sale of water in Antwerp for 50 years after the completion of the necessary works, for the sum of £280,000; and also the water-works now in course of construction.

THE LANCASTER CORPORATION WATER-WORKS ARBITRATION.—The award in this case, the proceedings in which were reported in the last and previous numbers of the JOURNAL, has been given by Mr. W. C. Gully, Q.C., the Arbitrator, who has estimated at £3500 the amount due to Mr. H. Garnett, from the Lancaster Corporation, as compensation for the water taken by them from his land under their Act of 1876. Mr. Garnett has also been allowed his costs of the application to the High Court of Justice, the Corporation to bear their own costs.

THE WATER SUPPLY OF CARDIFF.—Some time since the subject of obtaining an additional supply of water for Cardiff and the neighbourhood engaged the serious attention of the local authorities. A proposition has now been made to furnish such supply from Aber Brook, situated a few miles from Cardiff. It is stated that at a very moderate cost an embankment could be thrown across the Aber Valley, and thus impound about 100 million gallons of water; the reservoir being about nine miles north of Cardiff, and situated at such an elevation as to allow the water to gravitate in pipes to Cardiff and Llandaff. The water in the Aber Brook, when only half bank high, runs at the rate of 15 million gallons in the 24 hours, and one of its characteristic features is that in times of flood it flows down in a comparatively clear state. The scheme, which is by Mr. G. A. Lundie, M.Inst.C.E., of Cardiff, is estimated to cost £78,250, against which would have to be placed the sum of £1140 per annum now paid for pumping, which would be saved if the proposed works were carried out, and a yearly revenue of £860—together, £2000. This capitalized at 4 per cent.—£50,000—and deducted from the estimated cost of the scheme, would leave the net cost only £28,000. The new water supply would be taken from pure sources, and be soft in character.

THE BARTON LOCAL BOARD AND THE IMPROVEMENT BILL OF THE SALFORD CORPORATION.—A special meeting of the Board of the Barton Local Board was held on Monday, the 6th inst.—Mr. H. Leigh in the chair—for the purpose of taking steps in opposition to certain clauses in the Bill which it is the intention of the Salford Corporation to introduce into Parliament in the forthcoming session. The clauses to which the Board specially object are to give the Corporation the power to supply the electric light to the districts which they now supply with gas, the Barton Local Board being one of those districts. The Clerk (Mr. G. Trenbath) read a lengthy correspondence which had taken place between himself and the Salford Corporation. One letter which he had received from the Town Clerk of Salford (Mr. C. Moorhouse) stated that the Corporation had no desire to have any intervention in the matter of the electric light, and if the Local Board preferred that they and the inhabitants of their district should not be supplied with it by the Corporation, they (the Corporation) were perfectly indifferent about the matter, and would confine their application to their own borough, and he (the Town Clerk) had, by a meeting of the General Purposes Committee, been instructed to alter the wording of the Bill accordingly. Mr. Trenbath thought the Board ought to take steps to obtain *locus standi* in Parliament, and the consent of the ratepayers to oppose the Bill. On the motion of Mr. B. Spary, seconded by Mr. A. Black, it was resolved, "That this Board hereby consents to the opposition in the next session of Parliament to such clauses or provisions of the Improvement Bill of the Salford Corporation as relate to the supply within the limits of this district of gas, light, and heat produced by electricity."

BLACKBURN CORPORATION GAS SUPPLY.—At the meeting of the Blackburn Town Council on the 2nd inst.—Alderman Hutchinson in the chair—the minutes of the Gas Committee were next session of Parliament to such clauses or provisions of the Improvement Bill of the Salford Corporation as relate to the supply within the limits of this district of gas, light, and heat produced by electricity.

BLACKBURN CORPORATION GAS SUPPLY.—At the meeting of the Blackburn Town Council on the 2nd inst.—Alderman Hutchinson in the chair—the minutes of the Gas Committee were next session of Parliament to such clauses or provisions of the Improvement Bill of the Salford Corporation as relate to the supply within the limits of this district of gas, light, and heat produced by electricity.

The Treasurer had in hand £9500, and he believed the profits of the gas-works this year would not be less than £4000. He knew that two years hence they would have to set aside a redemption-fund, probably amounting to £7000 per year; but at that time he took it the Council would have a reserve-fund, which they were not required to hold by their Act, of £15,000. He thought, therefore, they might very safely reduce the price of gas 2d. per 1000 feet, in anticipation of the increased consumption, with the reserve-fund they had in hand towards paying for the redemption of the works. The proposition he intended to submit to the next Committee meeting was that after the 1st of January next a reduction of 2d. per 1000 feet be made to those consumers who pay their gas bills before the sixth day of the second month of the quarter. He believed that this would effect an immense economy in the collection of the accounts. Mr. Abram said one reason why the Committee had not been able to cheapen gas

before was that they were saddled by the Poor Law authorities with very heavy taxation. No gas-works in England, for a town of the same size as Blackburn, were taxed to anything like the same extent. Although they had been heavily taxed before, the assessment of the works had been very recently raised £2000. He was ready to support Mr. Bonds in his proposal to reduce the price of gas even to the extent of 3d. per 1000 feet—not merely to the rich, who paid their bills soon, but to the poor, who could not do so. Mr. Bonds remarked that there were 15,000 or 16,000 gas consumers, and the delay in payment applied equally to all classes. The Chairman said he did not think the Council should make any reduction until they were in a better position, and saw what would become of the electric light. They had a large capital invested, and must get it back. The minutes were confirmed.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 5040.—DEVINE, H., Manchester, "Improvements in the construction of gas regulators." Dec. 3, 1880.
- 5041.—THORP, T., Whitefield, and TANKER, R., Prestwich, Lancs., "An improved apparatus for regulating the flow of gas to burners." Dec. 4, 1880.
- 5090.—FOULIS, W., Glasgow, "Improvements in gas-engines." Dec. 7, 1880.
- 5099.—STRAED, W., Northallerton, Yorks., "Improvements in meters or apparatus for measuring or ascertaining the flow of liquids or gases through pipes or conduits, which improvements are also applicable to motive power engines and pumps." Dec. 7, 1880.
- 5100.—BARLOW, H., New York, U.S.A., "An improved apparatus for regulating the pressure, and economizing the consumption of gas in its passage to the burners." Dec. 7, 1880.
- 5101.—RICHARDSON, W. B., Birmingham, "Improvements in gas-engines and in apparatus connected therewith for the supply of gas to them." Dec. 7, 1880.
- 5102.—TALAARD, N., Paris, "Improvements in pipe-joints." Dec. 7, 1880.
- 5116.—SCHLESSEER, R., Manchester, "Improvements in the construction of water-meters." A communication. Dec. 8, 1880.
- 5121.—DEFRIES, C., Houndsditch, London, "Improvements in gas-burners." Dec. 8, 1880.
- 5123.—COWAN, W., Edinburgh, "Improvements in gas-governors." Dec. 8, 1880.
- 5125.—MAYS, J. A., Great Winchester Street, London, "Improvements in valves for regulating or controlling the supply and discharge of water or other fluids." Dec. 8, 1880.
- 5130.—LIVERBY, J., Westminster, "Improvements in gas motor engines." A communication. Dec. 8, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 2338.—WILSON, J. G., Manchester, "An improved construction of condensing steam engine and boiler with automatic air or gas and water supply, also applicable to other steam generators or boilers." A communication. Dec. 4, 1880.
- 2401.—BURGLASS, C., Birmingham, "A new or improved water tap for the prevention of waste, or the possibility of freezing." June 14, 1880.
- 2458.—BEST, G., March, Cambridgeshire, "Improved mechanical apparatus for purifying and softening water by removing therefrom the lime and other hardening matters held in solution." June 17, 1880.

PATENTS WHICH HAVE BECOME VOID

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.
- 4323.—PIPER, C., "Improvements in the apparatuses for the purification of coal gas." Nov. 19, 1877.
- 4398.—SCHÜCKLE, J., "Improvements in dry gas-meters." Nov. 23, 1877.
- 4400.—SCHÜCKLE, J., and E. G., "Improvements in means or apparatus for carbureting and purifying coal gas." Nov. 23, 1877.
- 4452.—WISSE, W. L., "Improvements in lighting apparatus." Nov. 26, 1877.
- 4479.—AUBE, P., "Improvements in the manufacture of gas and in apparatus relating to its production." Nov. 28, 1877.
- 4520.—BURTH, "Improvements in purifying water." Dec. 1, 1877.
- 4576.—HILTON, M., "Improvements in the manufacture of gas." Dec. 3, 1877.
- 4594.—PLATT, J., "An improved automatic gas-stove for heating iron." Dec. 4, 1877.

PATENTS WHICH HAVE BECOME VOID

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.
- 3868.—PARKER, J. F., and WADE, A., "Improvements in the process of and apparatus for the manufacture of coke and illuminating gas; in which improvements may also be applied to the smelting of iron ores and other ores." Nov. 26, 1873.
- 3910.—BELL, J., jun., and R., "Improvements in utilizing the waste heat of materials employed in retorts, and in the apparatus or means employed therefor." Nov. 29, 1873.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Dec. 8, 1880.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)					Sulphur. (Grains in 100 Cubic Feet of Gas.)					Ammonia. (Grains in 100 Cubic Feet of Gas.)					Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company	Notting Hill	18.0	16.8	17.3	11.6	8.6	10.3	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	None.	In excess
	Camden Town	17.5	16.6	17.0	18.0	15.5	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	"	"
	Dalston	17.1	16.8	16.9	11.8	9.0	10.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	"	"
	Bow	17.3	16.6	16.9	14.6	10.5	13.3	0.3	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	"	"
	Chelsea	17.0	16.3	16.6	18.3	14.0	16.3	0.5	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	"	"
	Kingsland Road	17.2	16.7	16.9	13.6	9.0	11.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	"	"
South Metropolitan Gas Company	Westminster (cannel gas)	21.3	21.0	21.1	19.6	18.8	19.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	"	"
	Peckham	16.9	16.4	16.7	13.8	8.9	11.4	0.4	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	"	"
Commercial Gas Company	Old Ford	17.9	16.7	17.1	19.8	12.2	15.4	0.5	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	"	"
	St. George-in-the-East	17.3	16.9	17.1	12.6	10.0	11.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	"	"

(Signed)

T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for canal gas 20 sperm candles. Sulphur not to exceed 30 grains in the 100 cubic feet of gas at 60° Fahr., and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

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SPECIAL NOTICE TO SUBSCRIBERS AND OTHERS.

In consequence of the CHRISTMAS HOLIDAYS, the next number of the JOURNAL will not be published until Wednesday, the 29th inst.

TO CORRESPONDENTS.

H. G.—Too late for insertion this week.

A. COUNTRY MANAGER.—Have you noticed our fortnightly reports of "Current Sales of Gas Products"—one of which appeared last week, page 936. As opportunity occurs we shall extend the reports so as to include sales in other of the large centres of the chemical industry.

A. COUNTRY MANAGER (No. 2).—The works to which you refer can obtain gas from any source they choose. You cannot exclude your rivals supplying gas to the whole of the establishment—even to those parts lying within your parliamentary limits, if we understand aright the very vague particulars you give. It would be well for the future to remember the lines: "He who will not when he may; when he will, he shall have, nay."

In the "Circular to Gas Companies" last week, second column of page 922, a transposition of lines occurred. The 18th line should have been the 20th.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 21, 1880.

Circular to Gas Companies.

The winter draws on apace, Christmas will soon be with us once more, the days are even now at their shortest, and yet, in London at least, the weather has been exceptionally mild during the past few weeks, and, stranger than all, there has been little or no fog. Perhaps this accounts for the fact that fogs have formed very popular subjects of discussion of late. If there has been but slight fog in our streets, there has been plenty in the minds of a number of people. Fogs have been indicted at the bar of public opinion; they have been lectured about, written upon, and talked of until the discussion on the subject bids fair to become almost as great a nuisance as the fogs. Much of the public interest in the matter is undoubtedly due to Dr. Alfred Carpenter, who has made a regular hobby of the subject. It is perhaps difficult to see why Dr. Carpenter should particularly concern himself with

London fogs, except probably that the whole subject is one which, from its nature, is certain to appeal strongly to public notice, and may be carefully worked up into an unlimited number of letters to the newspapers, and into not a few lectures, by any one who will take the trouble to treat it in a pseudo-scientific manner. We are nothing now-a-days if not scientific, and it is consequently possible for any persevering "scientist" to obtain a certain amount of *kudos* by dressing up a familiar subject in language calculated to convey the impression that he knows more about it than other people. We are afraid that Dr. Carpenter's case is something like this. When he first wrote to *The Times* the graphic letter, describing a West-end fog, which furnished that organ with material for a social leader, he did good service by calling attention to a decidedly preventable nuisance. Unfortunately, the notoriety he thereby obtained has apparently convinced him that he is the authority of the age on fog and its cure, and he has given the world his views thereon in several published letters, and at least two lectures. It is necessary to say that, as far as Dr. Carpenter is concerned, the subject has been already overwrought, and unless he has something better to offer by way of suggestion for the prevention of fogs than is contained in his lecture before the Society of Arts on the 8th inst., he had better dismount from his hobby before that long-suffering creature throws him. The matter is too important to be allowed to suffer from the feeble advocacy of persons whose sole right to deal with it is in their own pertinacity. Sanitation generally has almost become a bore from the number of dilettanti who have taken to meddle with it. Social Science is in the same plight. It would be a cause for regret if the rising discontent with the existing conditions of town life, which make yellow fogs possible, were to be similarly stifled by the multitude of would-be experts endeavouring to mount by it into publicity. Yet this will assuredly be the result, unless the present discussion takes a more hopeful turn.

Dr. Carpenter's last lecture is divisible into two parts—the description of the evil, and its possible cure. The first we all know about. A moment's experience of a pea-soup fog will convince one that coal-smoke is its chief constituent, more powerfully than columns of exhaustive disquisition as to what is not. It then only remains to remember that the chief source of coal smoke is the combustion of the usual fuel of domestic hearths, to arrive at the mental conclusion that if the smoke-producing action of such fires could be better regulated, or altogether abolished, fogs or mists might recur, but they would be divested of that quality which constitutes the great nuisance complained of in towns. This conclusion appears so direct that it is the merest waste of time to dilate upon it further. The pungent odour of the smoke of a moorland village is sufficient evidence of the peat fires of the cottagers, without an analysis of the air of the locality; and as little do we require a lecturer to tell us of what our town fogs are made. The second part of the lecture in question is, however, that to which we take the greatest exception, although it seems to have been the lecturer's object to advocate the extended use of gas. Briefly, Dr. Carpenter wishes to invoke Government aid for the purpose of carrying into force the following extraordinary proposals:—Local Authorities are to be empowered to levy a tax upon every fireplace so constructed as not to consume its own smoke. There is no question of how this is to be effected, the intention being by implication to render coal fires altogether illegal. The proceeds of this tax are to be used in the purchase of the gas and water works of the district, thus enabling the Local Authority to acquire these undertakings without having recourse to the rates for raising the necessary capital. "Gas, like water, has become a necessity of life; no large town can carry on its work in the world without gas." It is false political economy for dividends from gas and water to be paid out of the life-blood of the country. Its "property should provide the capital for the purchase of such works. That capital should be sunk at once, and the consumers of both gas and water should only be called upon to pay the cost price of the product, with such other charges as might be sufficient for the maintenance of the works in an efficient state; and, when extensions are required, the property requiring the extension should pay the cost." We quote this sublime passage, as we feel quite unequal to the task of paraphrasing it so as to do justice to the glorious jumble of principles it contains. Read with the prior suggestion of the tax on smoke and its application, it clearly shows the lecturer's command of his subject. Immediately after this, the example of the Metropolitan area is given, as it would be affected by the new regulations. Supposing four million fireplaces to be now in existence within this district, we are

bidden to calculate in this wise:—"An average tax of 20s. upon each of these, payable after two years notice, would cause the removal of three-fourths of them, and the remaining million would provide a fund which would, for a time, go some way towards paying off principal and interest upon the purchase of the London Companies claim in their works." Besides this, no coal is to be sold for private use which has not been deprived of its smoke-producing qualities.

This is Dr. Carpenter's plan for rendering London smokeless and fogless. Criticism pales before such autocratic counsel; but we are constrained to remark that Dr. Carpenter has omitted to state one or two things needed to complete the scheme. He does not say when he expects to find a Government with so little other harassing employment that it will undertake a crusade against every house-coal proprietor, railway company, shipowner, coal merchant, and greengrocer in the land, to say nothing of other vested interests, and impose a tax certain to send every householder over to the Opposition. Neither does he say what would become of the Local Authority and their officials, if they were to attempt to collect such a tax. The window tax was enough for the Briton to bear, even at a time when he was more inured to taxation, indirect and otherwise, than he is at present; but a tax on light is a trifle to a tax on warmth. We should imagine that Dr. Carpenter himself would hardly care to be the first to collect it in a densely populated and smoky neighbourhood; in all probability there would soon be a vacant collectorship. It would also have been as well if Dr. Carpenter had told us precisely how far the million pounds to be obtained in such a way would go in purchasing the Metropolitan gas and water undertakings. And it might have been stated what should be done with the proceeds of the tax in such towns as Manchester, Leeds, and Birmingham, where there are no gas and water works to be purchased from private undertakers.

It may as well be stated at once that in respect of the practicality of his ideas—for they are nothing more—Dr. Carpenter must be classed with Dr. B. W. Richardson. In fact, if the former had headed his discourse with some distinctive title, to show that he intended to describe how the inhabitants of Salutation manage to escape fogs, he would have been more consistent than in recommending such visionary schemes for the land we live in. Dr. Carpenter has had his say on the matter of fog-prevention, and it is to be regretted that so much of what he has said is simply trash. Speaking in the interest of gas manufacturers, we distinctly repudiate all desire for assistance in extending gas consumption by compulsory legislation of any kind, or for parliamentary aid in any way, except in the removal of disabilities when they are proved to exist, and in the regular protection of gas property. The idea of revolutionary enactments such as some of the modern school of social and sanitary reformers so calmly contemplate, is too absurd even for ridicule. The extended consumption of gas for purposes other than lighting is a very desirable thing, but it will come without laws rendering it penal to have a coal fire. If Dr. Carpenter were to follow the example of Dr. Siemens, and give some practical help towards the final extinction of coal fires by suggesting a good substitute wherein gas is used, the public would have much more cause to be grateful to him than for his recommendation of legislation for which neither the time nor the subject is ripe. Dr. Carpenter prophesies that coal gas will cease to be used for lighting purposes. It may be that such a time will come, but in all probability not before it is made felony to sell coal. Meanwhile, we are not in such a bad case as we can afford to congratulate ourselves on having such as Dr. Carpenter for our friends.

The Corporation of Salford do not lead a very easy life either among themselves or with their neighbours. After great debate the Council have approved of the promotion of the Corporation Bill, of which notice has been given for next session. This Bill, among other things, is intended to contain clauses empowering the Corporation to supply gas, light, and heat by electricity. The matter is not particularly clear, as reported in the local papers, but at all events, the proposal to insert these clauses has aroused the most intense suspicion and discontent in the districts of Barton and Eccles. The Board entrusted with the control of these out-districts are chronically suspicious of the Salford Corporation, and have incited the ratepayers to oppose the extension of the powers of the latter body beyond the limits of the borough. To do them justice, the promoters of the Bill have expressed their willingness to meet the wishes of the objectors, and to limit the Bill accordingly. This course has not pacified the

Barton Board, and they will therefore formally oppose the Bill in Parliament until they are quite satisfied that the Salford authorities will be unable to steal a march upon them in the matter in question. It does not appear, however, that the opposing Board have any more serious object in view than the preservation of the independence of their district against insidious encroachment on the part of Salford. There is no reason why the Salford authorities should desire to supply electric lighting for the outlying districts, as they will be restrained from making a profit by it, and therefore they lost nothing by yielding to the request of the Barton Local Board.

The fate of one Provisional Order, notice for which was given for next session, has been already decided. We have occasionally referred to the affairs of the Corporation of Bolton, where some difficulty has been experienced in obtaining the consent of the ratepayers to a Bill authorizing an extension of the gas-works, and containing other provisions of a general character. The statutory towns meeting, in fact, declined to support a Bill, whereupon it was considered desirable by the Gas Committee to apply for a Provisional Order for their own purposes, leaving the general Corporation legislation to some more auspicious occasion. At the last meeting of the Council it was announced that the purchase of additional land for the extension of works, which had been considered so urgent as to warrant a special application to the Board of Trade, had been deferred for a year; and thereupon the proposed Provisional Order was abandoned. The latter mode of procedure was, at best, an unsatisfactory substitute for the Bill at first advocated, and there were even doubts as to its sufficiency for the required purpose, so that there will be nothing lost by the year's delay, if it results in a future Bill of a comprehensive nature being adopted. The failure to obtain the necessary sanction to the Bill this year appears to have been due to the fact that it was presented to the Council in a very crude state, and, as alleged, took some of the members by surprise. Under these circumstances, the late *fiasco* is intelligible, if not creditable to those concerned. It may at least be said that the possibility of postponing the purchase of land for a year might have been ascertained by the Gas Committee before their abortive rush for an Order.

The arbitration proceedings now in progress with respect to the rating of the Sheppy Gas Company's undertaking by the Guardians of the Sheppy Union, involve several nice points of principle. The accounts of the Company, giving the results of their business operations, are not disputed. It is acknowledged by both sides, as the point of departure, that the gross annual receipts of the Company amounted last year to £6893, allowance having been made for discounts and bad debts. The working expenses were also taken by both sides at £3517, with the slight difference that the Surveyor for the Guardians naturally included a larger sum for rates, which would proportionately increase this amount. The gross profits were therefore taken as amounting to £3376. Beyond this stage the two contending parties began to diverge widely in their estimates of the actual rental to be given by a hypothetical tenant for the right to receive these profits from the particular concern in question. Differences arose as to the definition of the term "hypothetical tenant"—whether he should be taken as an incoming stranger, on yearly or perpetual lease, or whether the actual proprietors should be considered as tenants. The greatest contention arose as to the amount of the hypothetical tenant's capital, and the allowances to be made out of revenue for maintaining the works, and for other purposes. We must refer to the report in another column for particulars on these points, the conditions being too complicated to permit of an intelligible abstract being here given of the considerations advanced on each side. Suffice it to say that the subject on which there was most dispute was the proper allowance to be made for repairs, in view of the present state of the Company's works. Although the Directors reported last year that the establishment under their control had been kept up to a proper standard of efficiency, they were compelled to plead before the Arbitrator that such had not been the case. All their own witnesses stated that the works are in such a dilapidated state that thorough reconstruction is imperatively required, and that, consequently, the sum to be set aside for maintenance must be unusually large. It must be admitted that the necessity for pleading of this character is very unfortunate, and the admitted incompatibility of the statements of the Directors and their experts, on the different occasions referred to, must tend to the detriment of the Company in one sense, although on the matter of fact there may be no

uncertainty. Under the circumstances, it is not at all to be wondered at that Mr. Clutton, the Arbitrator, reserved his award until he shall have personally inspected the works in question.

Herr Friedrich Siemens, in a letter which we publish to-day, informs us that his regenerative lamps, of which a notice was recently given in the JOURNAL, have already been introduced into this country, and that the desire for further tests of their performance expressed by us on that occasion has, to some extent, been anticipated by the report of Mr. T. W. Keates, the Superintendent Gas Examiner for the Metropolis, which will also be found in our correspondence column. We understand that Herr Siemens's lamps have long since emerged from the experimental stage, and are about to be largely manufactured in this country. It should be remarked that, according to a statement of the inventor, the failure of other attempts to increase the illuminating power of gas-flames by previously heating the air and gas supply has been due to the fact, only discovered by himself, that a special form of burner and air deflector is necessary in order to obtain all the desired effects from the heated air and gas. Other experimenters, who have remarked that the advantages of previous heating have appeared insufficient to compensate for the extra expense and trouble of such arrangements, have not only missed the point that no expense, beyond the slightly increased first cost of the lamp, has to be incurred in the regenerative process whereby the gas heats its own air, but they have also limited their experiments to the same kinds of burners as used with cold air, and they have not heated the air sufficiently. Herr Siemens's notched air deflector and peculiar burner, consisting of a ring of pipes, are, as he contends, necessary to the full development of the additional illuminating power rendered available by highly heating the air and gas. The pipes are of comparatively large area, and the flame consequently presents the appearance of an intensely luminous globe scored with vertical markings. The flame is steady, and turns downward quite regularly over the edges of the interior cylinder of porcelain. The models already in England are suited to street lanterns, and are confessedly not capable of giving results equal to those obtainable by the standard form figured in our recent notice. It is, however, certain that Herr Siemens has inaugurated a new departure in the matter of gas lighting on a large scale, and in all probability his lamps, even in the present form, will be found most useful for many reasons, while it is evident that they may be susceptible of great improvement.

The paper on gas-engines read by Mr. G. G. Ramsdell at the last meeting of the American Gaslight Association, and reproduced in another column, is interesting on account of the author's manner of dealing with his subject, and also as an evidence of the extended demand for gas motors in places where gas is commonly sold at very much higher prices than are usual in this country. It is instructive, by way of commentary on the amount of competition to which the gas industry is subjected in these kingdoms, to remark that the experience of our American brethren shows that much activity is possible in pushing the sale of gas, even when it is priced at about 10s. per thousand cubic feet, and in a land where petroleum is native, and quite a drug in the market. We sometimes hear a great deal concerning the wonderful development to be expected in the general consumption of gas when it can be sold in English towns at about eighteenpence, or less, per thousand feet. While acknowledging that every reduction in price is a powerful incentive to increased consumption, it is evident, from contemporary examples, that it is not its cheapness only which causes gas to be esteemed by the public. Hence it is clearly unnecessary to expect that a new set of inducements to use gas for cooking, heating, or power will spring into existence with a greatly diminished selling price of gas. Whatever are the inducements to use gas for any purpose, they are as operative in kind, though not in extent, when gas is worth 10s. per thousand feet as when it is sold at little more than one-tenth the price. If this principle were fairly appreciated, we should hear less of specially-made gas to be sold at an abnormal figure in view of an unusual demand; and it would be more clearly perceived that common coal gas, produced under favourable conditions as to capital, is and will be as cheap as any locality may require. It would, of course, be overstating the point to say that a man who will not consume gas at current rates will be no more likely to do so if it should be reduced to only half the price; but there is a great proportion of truth even in such an extreme statement as that would be. It would, perhaps, be putting the case more

fairly to say that a man who would consume gas worth eighteenpence per thousand will in all probability be a consumer when gas is sold at double the price, or more; he will only use it more freely as it is rendered cheaper.

One of our correspondents this week puts in a plea which we trust will not be altogether dismissed by those of our readers to whom it may seem to most directly appeal. It is an old grievance, heard from time immemorial, and from all classes of workers, that work and wages are frequently imperfectly adjusted to each other. The honest sailor, of the ante-ironclad era, who wished that the shot of an approaching enemy might be distributed on the same principle as the prize-money—the greater part among the officers—is the prototype of many a subordinate in more peaceable callings. There is always more or less discontent among persons in inferior positions when they recollect the difference between their emoluments and those of men above them, who have not apparently so much labour expected of them in return. There must always be these differences, and if the discontent of the poorer man takes the active shape of emulation, his comparative poverty may prove his best friend. But the disproportion need not be so extreme as is sometimes the case. The assistant or clerk must have enough, not merely to live upon decently, but to make him conscious that his position is respected by his employers. Gas Companies and Corporations owe much—sometimes more than is suspected by Directors and Committees, or admitted by the heads of departments—to those for whom our correspondent pleads. Frequently they labour, and others reap the reward which should be theirs by right. From their position they are condemned to natural seclusion from the personal notice of the supreme powers; but it is therefore the more incumbent upon the latter to see that their material interests are not neglected. To those whom it may concern—and we know that our words will not be uttered entirely to the idle winds—we would commend our correspondent's petition as one addressed personally to themselves; that to them may be the credit of giving a kindly New Year's greeting to their deserving people, as to them will belong the responsibility of shutting their ears and hearts against such an appeal.

We are pleased to notice the appointment of Mr. Robert Mitchell, formerly of Coatbridge, but at present Manager of the Dawsholl station of the Glasgow Corporation Gas Commissioners, to the position of Engineer and Superintendent of the Edinburgh Gaslight Company, vacant by the recent resignation of Mr. Barclay Henderson. The circumstance will be found referred to by our Edinburgh and Glasgow correspondents, in "Notes from Scotland" this week.

Water and Sanitary Notes.

THE Directors of the Chelsea Water-Works Company, in their half-yearly report to be presented at the meeting of Proprietors to be held on Thursday next, refer to the present position of the Metropolitan Water Question, and express their regret that it will again become necessary in the next session of Parliament to enter upon an expensive contest in defence of the Company's rights. But they have no fear as to the result, being satisfied that the terms negotiated by the late Mr. E. J. Smith for the purchase of their property were such as could be supported under an arbitration. Nearly four hundred new supplies have been laid on during the past half year, representing a future net water-rental estimated at £1252 per annum. It is remarked in reference to the extra quantity of water pumped into the Company's covered service reservoirs at Putney Heath during the six months ending September last, that considerable waste still appears to take place in the smaller class of houses where the supply is constant and the fittings are of inferior quality. In common with the Metropolitan Water Companies generally, the Chelsea Company feel the rigour of the Vestries and District Boards in raising their assessments under the Valuation Act of 1869. This, it is stated, will add considerably to the item of "rates and taxes" in the Company's accounts during the next five years. The rates and taxes paid by the Company during the past half year, exclusive of income-tax, amounted to £3733. This is an appreciable sum in relation to a balance of rather more than £20,000 to be appropriated in paying a dividend at the rate of six and a half per cent. per annum on the £615,600 of the Company's ordinary stock. The Government Auditor, Mr. Allen Stincham, states in his certificate that the expenses incurred in respect of the oppo-

sition to the scheme of the Lower Thames Valley Main Sewerage Board, and of the recent negotiations for the purchase of the Water Companies—amounting in all to about £1700—are not included in the balance-sheet. The Directors say in their report: "It has been deemed just that the amount should be provided for out of the contingency-fund."

The bery of Analysts, to whose conflicting conclusions we made reference a short time back, have excited the attention of the Metropolitan Board of Works, who being apparently at a loss to understand the various statements respecting the purity or impurity of the London Water Supply, have asked to be enlightened by their Consulting Chemist, Mr. Keates. At last Friday's meeting of the Board, this gentleman presented a report on the subject, and this having been read, was referred to the Works and General Purposes Committee. Whether it is possible to bring about a chemical concert among the Analysts, we scarcely know, but something of the kind seems very much needed. There are four Chemists at work on the Metropolitan waters—namely, Dr. Frankland, Dr. Bernays, Dr. Tidy, and Professor Wanklyn, the last-named gentleman having Mr. W. J. Cooper associated with him. The first two on the list adopt the same process of analysis, but while one expresses the results in parts per 100,000, the other takes the gallon, consisting of 70,000 grains, as his numerical basis. Dr. Tidy expresses his results in parts of the gallon, but adopts a different method of analysis from that of Dr. Frankland and Dr. Bernays; and he also differs chemically in his statement of the results. Professor Wanklyn has yet another process of analysis, and gives his results in parts per million. Comparison is thus impossible to the uninitiated, and even the professional inquirer is likely to be baffled. Mr. Keates reduced the quantities to a common denominator, with a result not altogether flattering to the analytical gentlemen concerned. In so essential a matter as the estimated quantity of organic nitrogen, the figures are found to vary immensely. The difference is fifty-fold in one case, and a hundred-fold in another. There is evidently a mistake somewhere, and it were well for the credit of science if the Analysts could agree to adopt one process and one mode of reporting. But it is hopeless to expect there will ever be an agreement between Franklandites and Wanklynites, and the most one can expect is that they will take a common basis for their figures. Unfortunately, when the denominator becomes the same throughout, everybody is able to see how completely the chemical quartette are out of harmony with each other. Somebody, we may presume, is right, but assuredly not everybody. In the meantime, Lieut.-Col. Bolton must sigh in vain for a "standard of quality" to which all Metropolitan waters should be made to conform. At present there is a "battle of standards," and there is no sign of its ending.

It is curious to learn from a statement made at a meeting of the Vestry of St. Martin-in-the-Fields last week, that all the agitation in that quarter with respect to the Water Supply of London was originated by "a message from the Vicar," who thought the charge for water had become "somewhat alarming." Thus we know how the Delegates were called into existence—a body, concerning whom Mr. Watherston stated they held such various opinions that it was beyond his power to control them. Somehow or other the Delegates adopted a memorial to the Home Secretary, which was admirably adapted to damage the Vestries and the Metropolitan Board, and this having been found out, the said memorial has been kept back, and will not be presented at all. Under these circumstances the Vestry of St. Martin-in-the-Fields have presented their thanks to Mr. Watherston for his "zeal and energy," and are directing their thoughts to the forthcoming Bill.

The Lambeth Vestry have adopted Mr. Fowler's resolution, declaring in favour of regulation instead of purchase in respect to the Metropolitan Water Supply. An amendment, approving of a representative water authority, was rejected. Mr. Wiseman, who moved the amendment, endeavoured to justify his position by reading a letter from Professor Rogers, M.P., who was on Sir W. Harcourt's Select Committee. In his letter, Professor Rogers saw fit to say that "Parliament, acting on behalf of the public, is not to be bullied by any Company or Companies, however strong and however important." This is perfectly true, but why does Professor Rogers say it? We are not aware that the London Water Companies have bullied anybody, but something might perhaps be said the other way. The Companies have been violently attacked and misrepresented, and having received it all with quietness, are now accused of having "bullied" the Legislature. If the unfortunate Mr. E. J. Smith were alive,

he might perhaps express an opinion of his own on the subject, which probably would not be acceptable to Professor Rogers.

The Stockton and Middlesbrough Water Board are in a state of commendable anxiety with reference to a scheme promoted by the Teesdale Board of Guardians, as the Rural Sanitary Authority of Gainford, for erecting certain sewage works on the banks of the Tees. The scheme is objected to as likely to imperil the purity of the water supply. What degree of purity attaches to the supply at the present time, we do not know. At one time, when the supply belonged to a Company, the Local Authorities made many complaints on the question of quality, but when the supply came into their own hands, the Authorities considered it would cost too much to attempt a gravitation scheme; consequently they have since drawn from the river. Whether the sewage discharge from Barnard Castle, and the waste from the lead mines, together with all other sources of pollution above the intake, have been duly dealt with, we hardly dare to say. We should presume that everything of this kind has been intercepted and disposed of, otherwise we can scarcely account for the alarm which is excited at the prospect of the purified sewage of a rural district finding its way into the stream.

The Lower Thames Valley Main Sewerage Board are earnestly debating as to the course which they are to pursue in order to dispose of the sewage of their district. A discussion of nearly four hours duration which took place last week, led to a rejection of two amendments, and the further consideration of the original motion was then adjourned. The Board apparently despair of getting the approval of the Local Government Board to any scheme of irrigation, and in this they are doubtless right, on account of the violent opposition which any such scheme is likely to provoke in a district of so residential a character. It is thought to be not quite so certain that the Local Government Board would reject a scheme of precipitation, but it is argued that if precipitation be adopted, it could be carried out on a small scale in each neighbourhood, and the Joint Board might just as well be dissolved. Kingston has already asked to be released, and although Mr. Dodson has not indicated any disposition to favour this request, it is formally under consideration. The Local Government Board are evidently favourable to the project of Sir Joseph Bazalgette for diverting the whole of the sewage of the Lower Thames Valley into the West Kent Board's system, and the Sewerage Board seem to have no alternative but to adopt that scheme. An important announcement, which rather interferes with the project, was, however, made to the Sewerage Board at its recent sitting, by their Chairman, Sir T. Nelson. The Port Medical Officer of London has reported to the Corporation that in the month of July last the River Thames was in a very unsatisfactory state from the presence of sewage, the smell being at times "almost intolerable." Numerous complaints are said to have been made by persons afloat and ashore, and especially by ship captains. The annoyance was greatest at Woolwich and Barking, and when the West Kent outfall comes into operation about twelve months hence, it is expected that the nuisance will be still greater. What all this means remains to be seen.

We notice that the Rustless and General Iron Company (Messrs. James E. and Samuel Spencer) have removed their offices to 3, Queen Street Place, Cannon Street. Also that the London offices of Messrs. John Abbot and Co., Limited, of Gateshead-on-Tyne, are now at 106, Cannon Street. Messrs. Coates and Co. being appointed their Agents for the South and Midland districts of England.

THE SHEFFIELD CORPORATION AND THE WATER COMPANY.—At the last meeting of the Sheffield Town Council a Committee was appointed "to consider the Bill of which the Sheffield Water-Works Company have given notice; to watch the proceedings of the Company in the preparation of such Bill; and to report to and advise the Council thereupon—with power, if necessary, to present a petition, in the name of the Council, against such Bill." It was stated that the Company would be approached in a friendly spirit, and a petition might not be necessary; but of course no expense could be incurred in regard to any petition without the sanction necessary under the Municipal Corporation (Borough Funds) Act.

THE USE OF WATER GAS IN CANADA AND THE UNITED STATES.—The Toronto Mail of the 25th ult., under the heading of "The Poisonous Gas Committee," gives an account of the meeting, on the previous day, of a special committee which has been appointed to inquire into the quality of the gas supplied to the city. In the course of the proceedings the Chairman (Alderman Walker) stated that he had received a letter from a gentleman well versed in the qualities of gas, in which he stated that the gas now supplied to the citizens of Toronto should be prohibited by parliamentary enactment. In New York alone no less than nine deaths had occurred within the past two years from gas poisoning, and as many more not reported, while numerous cases had appeared elsewhere; and, further, that every solitary death in New York had occurred where water gas was used. Since water gas was supplied in Toronto (in January, 1879) six deaths had taken place from it, and in addition several other cases had proved nearly fatal. He further stated that a law had been passed in Massachusetts prohibiting the sale of the so-called water gas. After some discussion the matter was referred to the City Solicitor to report upon the city's power to deal with the matter.

THE ENCOURAGEMENT OF GAS CONSUMPTION.

SECOND ARTICLE.

WE noticed last week, under the above heading, certain causes specially operative at the present time in directing attention to the important question of extending the uses and the consumption of gas. We return to the subject in order to mention some of the ways by which this generally desired object may be attained. Last week the advantages that would accrue to gas makers from the pursuit of the policy advocated were incidentally dealt with; and we may to-day be permitted shortly to revert to this topic.

It may be stated broadly that the profits arising from any growing business will increase in a greater ratio than the gross returns; because, at least in the great majority of instances, it is more economical to manufacture on a large than on a small scale. What is true generally is true in the case with which we are interested; an increased consumption of gas enables a Gas Company to reduce the selling price, and a reciprocating action is set up, the reduced price causing a further increase of consumption. Thus the cause and effect continue to act and react, to the mutual advantage of user and producer. This is the case with old and new Companies alike. With the latter the effect is due partly to the more effective occupation of the plant, and partly to the diminished proportion which many charges of a more or less fixed character bear to the larger rental; with the former the more economical construction of the works required to meet the larger demand is chiefly to be credited with the lessened cost of the additional supply. In such works the advantages of improvements in manufacture, tending to cheapen production, would be equally applicable to old business and to new, and they do account for much of the steady reduction apparent in the cost price of gas. But the new business is not weighted with the heavy capital charges which attach to the old, and for this reason is proportionately more valuable. Let us suppose the case of a town where the price of gas is 3s. 6d. per thousand cubic feet, that price including, say, 1s. 2d. per thousand cubic feet for interest or dividend. This is a proportion not unusual, and most of our readers will be able to supply themselves, from their own experience, with an illustration very near it. Now, such a charge for dividend is no longer necessary with the lessened cost of much of the apparatus employed, more definite knowledge on the part of engineers of exactly what and how much plant they need to provide, and also the reduced charge at which, under the operation of the auction clauses, the necessary money is raised. In most towns of even moderate size, where ordinary maximum dividends are paid, new business can be met by an expenditure of capital which will not involve a greater burden than eightpence per thousand feet, and sometimes materially less. Here, then, is a difference of sixpence per thousand feet—a saving equal, let us say, to the payment of very nearly the whole of the labour employed in the production of gas and its delivery into the holders. This may be regarded as so much premium to the producers upon new business. In the ordinary case of a consumption doubling in eight or ten years, it alone would effect a reduction in price of threepence per thousand feet over the whole district within the same period.

Such an advantage as this, and others which will suggest themselves—as, for instance, the greater economy of fuel in large as compared with small works, the profit to be derived from the treatment of residual products, &c.—applies to an increase of business obtained on the ordinary lines, where the vastly greater proportion of the gas is used for lighting purposes, and its consumption limited to the hours between sunset and midnight. It has with many people become rather the fashion lately to discuss the position of the gas industry when gas has ceased to be the great illuminating agent—when, in fact, that honourable vocation has been assumed by another, and gas is relegated to the still useful, but much less ornamental purposes of heating, cooking, and the like. Some Chairmen of Gas Companies have contemplated this change “with a light heart,” which may have been as real as it looked. It is, however, more from those “good-natured ‘friends’” who want to administer a pill and at the same time take credit for a sugar-plum, that we receive most of this kind of encouragement or consolation, as the case may be; and we feel under no oppressive weight of obligation to them in return for it. It will be the commencement of a bad time for gas makers when they have to find other outlets for their chief product, not for the sake of increasing their returns, but to make up for losses sustained in their, at present, most important and useful field.

While we say this with all possible emphasis, we yield to none in the earnestness of our desire to see each of the uses

of gas cultivated to the utmost, and our expectation as well as hope is that the percentage of the total quantity of gas made which will in future be used for purposes other than lighting will rapidly increase. We have already referred to the lessened charge upon the gas for dividend on capital required to meet ordinary extension of business, and pointed out that it is by no means trivial. But when considering a development of this kind, where the demand would be chiefly in the daytime, and to that extent would call for barely any increase upon one-half of the capital employed—that sunk in gasholders and distributing plant—the economy in dividend charge is still further augmented. Added to this there would be further saving in leakage and the proportionate charges for distribution, management, collection, &c., all combining to make a day consumption of much more value to a Gas Company than an addition of the same rental value obtained from ordinary lighting sources. It would be palpably erroneous to say that it is more profitable to supply gas in the daytime for working an engine or cooking a dinner than to supply an equal quantity at night for purposes of illumination. Yet at the same time there is much to recommend the idea of charging a lower price for gas used for the former and like purposes. Gas light is at present an indispensable necessity in our towns, and consumers have no choice as to those from whom they will buy. Gas-engines, on the other hand, will only meet with acceptance as they are able, in comparison with steam-engines, to develop points of economy or other advantage, and similarly gas stoves as against ranges heated with coal or coke.

We believe we are not over-estimating the advantage of this day consumption “found,” as it were, and added on to the work of a Gas Company, at one shilling per thousand feet. If, therefore, the obtaining of this business will enable the Company to produce more cheaply, it is not unreasonable that some inducement should be offered to secure it; and a reduction in price of, say, sixpence per thousand feet would offer such inducement, while leaving a balance to be applied in cheapening the cost of gas for lighting purposes. On this point the experience of the little Danish town of Nakskov, as told in the JOURNAL* eighteen months ago, is instructive. A differential price has been there instituted, with the result that in 1878 forty-eight per cent. of all the gas sold was for cooking and heating purposes, while in the summer quarters the proportion used for this purpose exceeded rather considerably that for lighting. The laying on of special services to stoves would somewhat reduce the economy in capital expenditure, but it would be amply repaid, and would have further and great advantage on the score of efficiency. Very much can be done to popularize and extend the use of gas for these subordinate purposes, without necessarily reducing its price. Gas Companies and Gas Committees should put off, at least in this direction, the monopolist, and put on the trader, taking their wares to the consumer rather than waiting for him to be enlightened, in some accidental or extraneous manner, as to their value, and so come unsolicited to buy. We have offered no stinted praise to those who have sought to do this by opening exhibitions of gas apparatus, and to others, more numerous, who have adopted—some for many years past, others quite recently—the plan of selling or letting on hire stoves for heating and cooking. Good as these efforts have been, they are yet wanting in permanence or completeness. The best model hitherto furnished is that of the Paris Gas Company, which may once more be commended to our readers. The exhibitions should be permanent; the consumer should be enabled to see the best apparatus for the purpose he needs, and to know, on the authority of the Gas Company, at what cost the work required can be done; and experiments should be made for the purpose of weeding out the extravagant and offensive appliances, which cause dissatisfaction to the consumer, and discredit to the Company, and of bringing into prominence those that are really excellent. Another point of still greater importance is that the stoves or other apparatus, when fixed, should not be lost sight of by the supplier. Not only should the user be instructed how to keep his stove in proper order, but his consumption of gas should be watched, and assistance given to keep it within proper bounds. The excellent stories told by Mr. Travers, of the Cork Gas Company, in his papers read at the last two meetings of the British Association of Gas Managers, well illustrate the importance and advantage of such attention. The first obligation which has to be met is that of instructing the public as to the great advantages to be derived from gas; and, while we are grateful for such help as is

* See Vol. XXXIII., p. 991.

afforded in this direction by men like Dr. Siemens and others, for their recent advocacy of the extended use of gas, the obligation presses primarily upon Gas Companies, and is due by them both to their shareholders and to the public. The work would have this advantage in their hands, that while private traders would be chiefly concerned to make an immediate profit by the sale of their goods, Companies would regard this as a secondary object to that of providing and selling such apparatus as would be likely to prove permanently satisfactory to the users. But if the Gas Companies in London and the gas makers—Companies or Corporations—in other large towns are unwilling to undertake this task themselves, they will find it easy to obtain the assistance of others willing to help them in this direction, and work practically under their control, in return for such aid as could be readily afforded. This view of the matter will, we hope, receive increasing attention.

In this direction, then, we hope to see a large development of the use of gas. At the same time much remains to be done to give it full scope for its original and chief purpose—that of lighting. Vexatious hindrances to its introduction should be removed. For instance, what possible excuse can be offered for the practice of compelling a consumer to fix his own meter "because the Company are afraid of the responsibility for explosion"? The possibility of such a disaster is thereby thrust upon the consumer, and he is required to accept responsibility, increased greatly by his having to employ workmen certainly less skilled than the Company could readily supply. This and other impediments would vanish at once if the line now drawn at the entrance to a consumer's premises were abolished, and the Gas Company undertook to enable their customers to get the full benefit from that which they buy. Much has been done to put good burners within the reach of consumers, but the average gas-fittings of to-day are probably as faulty as they were ten years ago. Considerations such as these open up a most promising field for the enterprise of gas makers, by whom the great advantages it offers should be speedily enjoyed.

THE GAS SUPPLY OF PARIS.

An agitation for cheap gas, as our readers are aware, has been lately carried on in the French capital, and the latest phase of the dispute between the Gas Company and the Municipality is very fully set forth in the last number of the *Journal des Usines à Gaz*, from which, as the subject is of some interest in its incidental illustration of the conditions under which the gas supply of Paris is maintained, we extract a few matters for comment.

The Paris Gas Company enjoy their position by virtue of a concession originally granted by the Municipality in 1855, renewed in 1861, and again in 1870. This concession gives to the Company for a term of fifty years, dating from July 1, 1856, the exclusive right of laying mains in the public thoroughfares for the distribution of gas for the purposes of lighting and heating. During the term of the concession the Company are required to deliver gas to any person who may require it, at the fixed price of 30 centimes per cubic metre (about 6s. 6d. per 1000 cubic feet). A duty of 2 centimes per cubic metre (about 5d. per 1000 cubic feet) is payable to the Municipality on the total consumption of gas, and also a yearly rent of 200,000 frs. (£8000) for the subsoil occupied by the Company's mains. The Company are also compelled to supply at half price the gas for lighting the streets and public offices, and to maintain the public lamps belonging to the Municipality. Besides all this, any profits realized by the Company over and above a certain amount are divided between the Company and the Municipality, and at the expiration of the period of the concession the mains and works are to become public property. Thus it will be seen that the Company's customers have to pay for a number of other things besides gas. However, the price of gas has for some time been much grumbled at in Paris, and in the early part of the present year the Municipality took steps to appease the public clamour—not by meeting the Gas Company with a view to the redistribution of some of the burdens which virtually make the Company collect a large proportion of the corporate revenue, but by calling upon the Government to appoint a Commission of experts, to examine the process of manufacture carried on by the Company, with a view to determine whether, as alleged by some of the malcontents, the said process has been of late years so much improved as to bring the Company under the provisions of another stipulation, contained in the concession, to the effect that the public should participate in any benefits accruing to the Company by the adoption of any remarkable improvement in gas manufacture.

It was stated, in certain memorials upon which the action of the Municipality was based, that in many respects—particularly with reference to the treatment of residuals—such improvements had been introduced since the Company obtained their first concession as to materially reduce the cost of producing gas, but in consequence of which, so far from granting any reduction in the selling price of their gas, the Company had merely put so much more profit into their own pockets. On the face of it, the action of the Municipality was not very sensible, for they must have known that so long as the

Company fulfilled the terms of their contract, and divided the surplus profits with them, the desired reduction of price could only result in diminishing the annual subsidy received by the City from the Company. It certainly looks very much as if, following the bent of public bodies all over the world, the Municipal Council wanted to get their usual share of the plunder, and yet throw the onus of supplying dear gas upon the Company. We are assured by the contemporary press that in the course of the agitation against the Company, in which, for the sake of popularity, many Municipal Councillors took part, the benefit derived by the public treasury from the existing arrangements was carefully kept in the background.

In demanding an inquiry, the Municipality acted within their right, and the Commission was appointed, and conducted their labours in a conspicuously fair spirit. To begin with, they declined to carry their inquiry further back than 1870, when the present concession was signed, so that the inquiry became limited to a comparison between the process of manufacture as carried on by the Company in 1870 and 1880. This decision was a great blow to the agitators, who wished for an inquiry extending back to the date of the original concession in 1855, for, as they contended, the later documents merely re-enacted the provisions of the earlier agreements, no fundamental examination of the process of manufacture having been made from the first. The Commission, however, stated their conviction that the fairness of the price fixed in 1870 must have been well ascertained at the time, and that therefore they could not take cognizance of anything anterior to that settlement.

The Commission have submitted an exhaustive report, which will be translated and published next week, on the comparative working of the Company in 1870 and 1880. It should be stated at once that they have failed to discover any radical improvements as having been introduced into the manufacture of gas in this period, with the effect of cheapening to any noticeable extent the cost of production. As to the conversion and sale of residuals, of which so much had been said, the Commission found that no particular changes had taken place in the treatment of these products within the time specified, and, on the other hand, that the increased value of residuals did not come within the terms of the clause cited, as improvements affecting the cost of the production of gas. On all points the Commission reported in favour of the Company: so that the matter remains *in statu quo* pending a revision of the concession, to which the Company, with certain stipulations, express themselves willing to submit.

The detailed "study" of the Commission on the minor improvements and alterations introduced during the last ten years by the Company in their method of working, is instructive. It is shown that the average yield of gas per ton of coal has gradually risen from 1863 to 1879, the results of last year's working being 7 per cent. better in this respect than was usual before 1870. This improvement is ascribed to various causes, among which may be named the better retorts used, more perfect exhausters, and a better mixture of coal carbonized. High heat and quick charges are also credited with some of this additional yield. The charges have also been made heavier, in consequence of the heat (2200° Fahr.) at which the retorts are now worked. The more perfect control of the heat is also looked upon as a recent improvement. Much of the advancement in carbonization is due to the Siemens furnaces adopted by the Company, but anterior to 1870; since, however, having been much extended. It appears that the advantage is not altogether on the side of the Siemens furnace as compared with furnaces and settings of the ordinary construction, owing to the fact that the cost of erecting the former is much greater than that of the latter, an excess not quite covered by the saving in fuel. In the process of condensation, the apparatus of MM. Pelouze and Audouin is said to be a great improvement, dating from 1874. By the action of this apparatus, as adopted by the Company in all their stations, the subsequent chemical purification of the gas is facilitated, and a certain economy results, but not of sufficient moment to affect the selling price.

The treatment of residual products by the Company has for many years been very thorough. Almost every conceivable use to which these products could be put has been experimentally taken up by the Company at different times, and with varying success. Some of these processes have been abandoned, but tar and ammoniacal liquor are still fully treated. It appears that the profit on all the secondary products of gas represented in 1869 the small sum of 0.0747 fr. per cubic metre of gas. The proportionate value rose in 1875 to 0.1047 fr., which was the maximum, the present value being 0.0786 fr. The Commission consider the conversion of residuals in the light of a distinct industry, though carried on by the Gas Company on their own premises, but which might be carried on elsewhere; and for this reason they decline to recognize it as an integral part of a gas undertaking. It is shown that the production of anthracene and other derivatives of tar was practised before 1870, and that, in fact, the value of the more recondite hydrocarbon compounds has a general tendency to diminish instead of increase, in consequence of the quantities now thrown upon the market.

In conclusion, it may be said that the report is strongly tinged with the reflection of the Gas Company's statements, and although these are, of course, perfectly trustworthy, it is too much to expect of the Municipality that they should accept the Commissioners' remarks as terminating the difficulty. It now remains for the Municipal Council and the Company to reconsider the general question, and to arrive at some mutual agreement as to the price of gas and the disposition of the profits of the undertaking, which shall be more in unison with modern ideas than the organized black-mailing of the present concession.

THE PURIFYING PLANT AT THE JARROW GAS-WORKS.

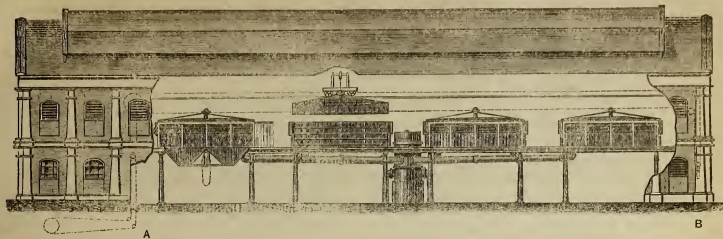


FIG. 1.

The accompanying engravings show the general arrangement of the purifying-house at the new works of the South Shields Gas Company, at Jarrow, and which, when reporting the proceedings at the last meeting of the North of England Gas Managers Association, it was promised should form the subject of early description and illustration. There are several points of novelty in this arrangement, which was designed and carried out by Mr. W. J. Warner, the Company's Engineer, and at the various gatherings of gas managers and others that have taken place at the Jarrow works, considerable attention has been attracted to the machinery and its surroundings.

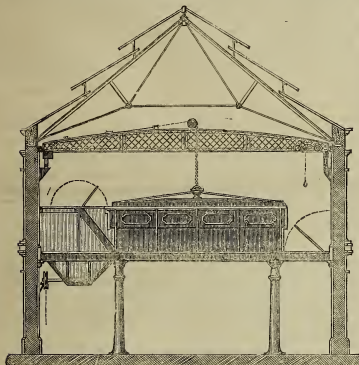


FIG. 2.

Fig. 1 shows an elevation of the purifying-house, with a large portion of one of the side walls removed, to allow the general arrangement of the plant to be seen; a cross section of the house is shown, on an enlarged scale, in fig. 2; while half of the house in plan, and the basement of the engine-room, also on an enlarged scale, are represented by fig. 3. The dimensions of the purifying-house, inside measurements, are—length, 120 ft. 6 in.; breadth, 35 ft.; height to eaves, 27 ft. 6 in.; height of basement to under side of girders, 11 ft. The engine-room is the basement of the exhauster-house, but we confine ourselves to the purifying arrangements.

The structure may be described as a composite building—concrete and a common class fire-brick. The walls are cut up by brick pilasters into bays of concrete; are divided horizontally by plinth and string-course of fire-brick; and are finished by an entablature of the same material. Each bay is panelled and rendered; and the interior is the same as the exterior in design and finish. The composite character of construction is extended to the roof; the principals or framing being of wrought iron, while the covering is carried by common rafters of wood, which may be said to be bolted to an angle-iron framing of purlins, dividing the roof into three sections, each being raised above the other. The covering is raised above the framing, and formed of Wade and Cherry's patent interlocking tiles laid on stout laths of wood. As the roof covering is raised above the framing, it is made easy of access for painting; and at the same time durability and ventilation are attained. With the open roof, louvre glazed windows are employed, which may be said to complete the ventilation. The tiles have been dipped twice in silicate Zopissa paint, which, with attention to other details, coupled with the hard and smooth nature of the walls, will undoubtedly contribute to the durability of the structure. In a district such as that in which these works are placed—amongst metal and chemical works—this should be aimed at.

The purifiers, which, with the roof, were erected by Messrs. C. and W. Walker, are 20 feet square by 5 feet deep, with planed joints. They are supported by cast-iron columns and girders, as shown. The centre-valve is faced, and has double covers, the same as was invented by Mr. Warner some years since, and was referred to in his "Notes on Purification," read before the North of England Association at Sunderland last October. By means of this valve entire control is obtained over the working of the vessels. By referring to the engravings, it will be seen that on one side of the purifiers are enclosed spaces, which form chambers, and are for the reception of the spent

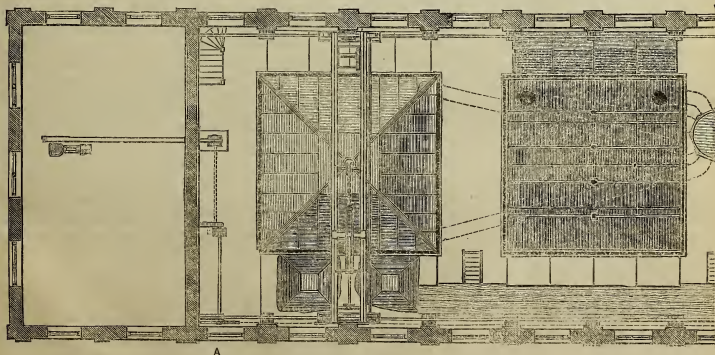


FIG. 3.

material when thrown from the purifiers. These hoppers are closed in by the hinged flaps on the tops. The lower portions of them are continued below the upper floor of the house; and the sides are inclined to each other, as shown, and closed at the bottom by sliding plates or doors. Upon the plates are fixed racks and catches, by means of which and a pinion geared to each plate, they are opened and closed by a short endless chain over a pulley keyed on to the shaft of the pinion. Thus the contents of the purifiers are discharged—if lime, into a cart or truck for removal; if oxide, to be worked slowly down an inclined shoot for revivification. On the other side of the house to the hoppers there are, the whole length of each vessel, trap-doors through which material is raised to the purifiers.

Just under the roof, on each side of the house, and extending the whole length of it, are steel rails, carried by cast-iron brackets built into the walls. On these rails runs the travelling crane. Its work is the lifting and carrying of the purifier covers, lifting the purifying material from the lower floor to the purifier level, and distributing it over the grids. The crane is also used to move the valve-covers, which it does by means of snatch-blocks. The power for actuating it is obtained from one of Langry's "Soho" engines of 6-horse-power, fixed in the basement of the exhauster-house; and it is transmitted to the crane by belting and an endless rope or cord passing over a V-grooved wheel, A, figs. 1 and 3, and pulleys at B, fig. 1, one of which is weighted, as shown, to put a tightening stress on the cord. This runs at a very high speed, and passes between three other pulleys of the same form of groove, so as to give the required power and motion to do the work. Four distinct driving and reversing motions are required. Three of these are obtained by simple friction gear—millboard bowl between two metal discs. The speed for travelling is reduced by worm and worm-wheel, which drives the crane in the usual way. For the lifting and lowering of the cover a screw is employed with a forked cross-head attached to a chain carried over a pulley; the whole being placed between the lattice girders, as shown at figs. 2 and 3. For traversing the load of purifying material a monkey is used, running between the girders, and driven by a cord. An endless cord is used for effecting the lifting of the load, which is done by the cord passing over a V-grooved pulley, on the shaft of which is a worm taking into a wheel keyed on to the barrel of the monkey. About a ton of material is lifted at a time, the discharge of which into a vessel is entirely under control.

The whole of this apparatus has been in use since the works were started, about eighteen months ago. The makers of the crane are Messrs. Wren and Hopkinson, of Manchester, and it is the joint production of Mr. Warner and this firm. It will be remembered that the same application of power to a travelling machine was described as being employed by Mr. Warner for driving his charging and drawing machine, and is equally satisfactory in both cases.

Between the old arrangement of house, crane, and working, and the present system, in a house with machinery such as we have described, there is a great contrast. The refinement of operation is well marked. The changes may have been slow, but progress has been made—progress in operation as in manipulation; and the skill required for the one will ensure the other. Thus will be promoted the introduction of apparatus and machinery that will improve and cheapen the manufacture of coal gas.

THE DESIGN AND CONSTRUCTION OF ENGINEERING WORKS.*

Mr. Campin's work forms a valuable addition to the well-known series of cheap technical books published by Messrs. Crosby Lockwood and Co. Although so much has been written on the subject of designing works of construction, and of the strains to which they are exposed, there is always room for contributions to the existing stock of a civil engineer's theoretical lore, especially when such additions are calculated to simplify the solution of the important problems with regard to stability and strength with which engineers are daily concerned. The present work is complete and authoritative as far as it goes. It does not follow the lead of the so-called elementary technical books, which merely indicate the outlines of their subjects, and leave the student to go farther for thorough information. It is intended by the author to deal fully with the matters included in its range, and it fairly succeeds in doing so. The author is not afraid to treat some very complex investigations of strains, &c., by simple arithmetical methods. He does not give a single formula which may not be worked out by any one acquainted with the meaning of algebraical signs, and able to solve a simple equation. This is in striking contrast to some authors, according to whom a simple wall cannot be calculated out without indulging in the differential calculus. It is, however, a feature on which Mr. Campin is to be congratulated, as it will tend to render his work intelligible and useful to a wide circle of practical men and students, who would turn with despair from the abstruse formulæ of Rankine. Mr. Campin's diction is clear and incisive, although he is guilty of the pedantry of adhering to the Latin form of the plural of "area." Surely this word is sufficiently Anglicized to form the plural without the awkward diphthong. This is, however, a minor fault which can easily be pardoned. Mr. Campin has some excellent advice to give on the proper execution of work, and the tables of strength of materials, &c., render the book as complete as its size permits.

MR. JOHN MARSHALL, of Newry, has been appointed Gas Manager to the Sowerby Bridge Local Board.

* "Materials and Construction." By Francis Campin. London: Crosby Lockwood and Co. 1881.

Notes.

[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

DR. C. W. SIEMENS'S GAS FIRE.

In the number of *Nature* for Nov. 25, Dr. Siemens replied to several criticisms on his gas and coke fire, as described in a recent "Note," and also mentioned a simpler and cheaper arrangement intended to secure a certain regenerative action with less expense than that of the copper grill and plate as originally illustrated. To the objection that coke gives off gases almost if not quite as injurious as the coal smoke it is intended to supplant, Dr. Siemens replies that the only gas would be carbonic acid, which is a necessary ingredient in our atmosphere. The same critic having advocated the use of asbestos in lumps, heated by gas, as a perfect form of gas fire, free from all smoke or nuisance, Dr. Siemens replies that theoretically 56 lbs. of coke, costing on an average less than 5½d., will develop as much heat as 1000 cubic feet of gas, costing 3s. 6d., thus showing the advisability of making the coke do as much work as possible. He also states that as the existing gas-works produce gas and coke very much in the proportions in which they would be required were his fires to become universally adopted, the regular consumption of both products would help each other, and the gas companies would be able to keep up the supply of the two commodities conveniently, and consequently cheaply. Mr. T. Fletcher, of Warrington, having claimed great superiority for the improved Abbottsford fire-grate, with close fire-tile backs, sides, and hearth, in comparison with which he says the proposed gas and coke fires would fail to show any economy, Dr. Siemens denies the transcendent merits of these grates, and, in further reply to Mr. Fletcher's allegations as to the cost of the copper regenerative plates, he goes on to describe his modified plan. Briefly, Dr. Siemens retains the gas-pipe just inside the lowest bar in front of the grate, and fits a cast or wrought iron plate in the back of the grate, united with a dead plate extending over the bottom bars to within a short distance of the gas-pipe. Three brackets unite the back and bottom plates, just as a cast-iron tank-plate flange is bracketed between the bolt-holes. The front edge of the bottom plate is vandyked or notched to a depth of an inch or more, to allow space for ashes to drop down. The dead plate does not lie directly on the bottom bars, but has on its under side a series of ribs running from the back plate to the front of the notches, thus providing as many channels for air to pass freely along to the gas flames. Hence it will be seen that when the dead plate is heated by the glowing coke lying on it, the air channels below are correspondingly heated, thus warming the air in its way to the point of combustion. If the fire-grate can be removed, the ribs underneath the dead plate may be made much deeper, and may then be covered in front by a shield; the back plate being, of course, carried down to an equal depth. The arrangement is made more perfect by the use of the shield in front of the air channels, which acts by directing the air more closely upon the heating surfaces. Dr. Siemens disagrees with the general tendency of grate builders of the present day, who look for economy to brick linings, as forming hot radiating surfaces. He maintains that this effect is obtained at too great a cost of fuel, and that superior economical results will be obtained by abstracting the heat from the back of the fire, where it is wasted, and concentrating it upon the purely carbonaceous material in front of the same, thus sending as much radiated heat as possible into the room, with the loss of but little by the chimney.

THE IGNITION TEMPERATURE OF GASEOUS MIXTURES.

At the meeting of the Académie des Sciences on the 15th ult., MM. Mallard and Le Chatelier submitted some observations on the ignition temperatures of certain gaseous mixtures. The explosive mixture of oxygen and hydrogen fired between 977° and 1067° Fahr.; the temperature being only lowered about 85° when the proportion of oxygen was increased one-half. The addition of nitrogen to the mixture made very little difference to the temperature of ignition, but carbonic acid slightly augmented it. An explosive mixture of carbonic oxide and oxygen took fire at about 1200° Fahr. Great variations in the relative proportions of carbonic oxide and oxygen only produced the slightest discernible differences in the temperature of ignition; but carbonic acid augmented it very remarkably. Nitrogen affected it but slightly. The slow combination of carbonic oxide is producible at temperatures much below that of its active combustion. Explosive mixtures prepared with hydrogen protocarbonate present a most interesting phenomenon. They are not only susceptible of slow combustion, but also, when subjected to a certain temperature, they are capable of igniting, after the expiration of a variable period, longer in proportion to the lowness of the temperature. The ignition temperature of such mixtures is not well determined. Although doubts exist as to the exact temperature at which a mixture of air and hydrogen protocarbonate will take fire, it is certainly not higher than 1455° Fahr., and the effect may be produced at temperatures far lower than this maximum.

THE MAXIM ELECTRIC LAMP.

A considerable amount of interest is being centred, in America, in the Maxim electric lamp. This lamp belongs to the incandescent class of electric luminants, as do the Swan and Edison lamps. The principle of all these devices is the same—a thread of carbon in a closed glass globe is rendered strongly luminous by the resistance it offers to the passage of a powerful magneto-electric current. It is essential to the endurance of the carbon thread that it shall be pro-

tested from all contact with air, in which it would be consumed. Both Swan and Edison seek to secure this object by exhausting the air from the interior of the globe, but in spite of all possible precautions the process is far from satisfactory. The residual air left in the globe after the most careful exhaustion, or that which leaks in from the external atmosphere, sooner or later causes the necessarily fine carbon wire to burn through at its weakest point, and then the lamp is, of course, rendered useless. It should be remembered that it is impossible to strengthen the carbons in any way; the thinner they are made, the less current is needed to develop the required light, so that the essence of the successful working of lamps of this class lies in making the carbons as thin as is consistent with continuity. They are, in fact, made of about equal diameter to a horsehair. Hence arises the difficulty that with the thinness of the carbon increases its efficiency and its liability to destruction. It is evident that an incandescent electric lamp, certain at some unknown period to suddenly break down, is open to the same objection as applies to the arc-light—it is impossible to depend upon its action from one minute to another. Mr. Maxim endeavours to prevent this tendency to sudden collapse by first exhausting the lamp-globes of air to a certain point, and then filling them with the vapour of gasoline. By a singular action the decomposition of gasoline by the current deposits carbon upon the carbon filament at the point where it is thinnest, and therefore hottest. In consequence of this remarkable effect of gasoline, the carbon becomes self-regenerating, and of practically unlimited endurance. The carbon deposited is identical in character with the substance formed in gas-reports, and is produced in precisely the same way—by the exposure of a highly heated surface to an atmosphere of hydrocarbon gas. The Maxim lamps are intended for use in apartments, &c., where the units of light are not required to exceed the illuminating power of an ordinary gas-burner; but one of the most striking peculiarities of these lamps is their capacity of being increased to almost any required power. Expressed in electrical terms, a Maxim lamp of 50-candle power was found by Professor Morton to require, when in full action, a current of 4.07 webers, giving about $5\frac{1}{2}$ such lamps to every horse power of energy of the current. Allowing for the average for all positions, and for the loss of energy due to the dynamo-electric machine, it therefore appears that these lamps actually give about 115 candles illuminating power for every indicated horse power developed by the engine.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

SIEMENS'S REGENERATIVE GAS-LAMPS.

SIR,—Happening to be passing through London, my attention has been drawn to an article in your JOURNAL of the 7th inst., entitled, "Siemens's Regenerative Gas-Lamps," in which you express a desire for keen examination by English gas engineers, so that some explanation may be added to the report of Herr Hasse's tests in Dresden. These tests, although not yet published, have been made, and I shall be very happy to afford facilities to any gas engineer in this country to satisfy himself upon the matter.

Previous to the sale of my French patents, my lamp was tested by M. Brisse, of the Paris Gas Company, and found by him to be 110 per cent. better than any gas-burner known there. Again, previous to the disposal of my English patents, ten complete photometrical estimates were made by Mr. T. W. Keates, F.I.C., Consulting Chemist to the Metropolitan Board of Works, and Superintending Gas Examiner to the Metropolis, giving as the result that for every 26 feet of 16-candle gas my lamp gave the light of 145 standard sperm candles of six to the pound.

FRIEDRICH SIEMENS, of Dresden.

Charing Cross Hotel, London, Dec. 13, 1880.

[ENCLOSURE.]

Report upon the Results of Experiments made with the Regenerative Hot-Air Gas-Burner constructed by Mr. F. Siemens, of Dresden.

This is a burner of large size, intended to consume about 22 cubic feet of gas per hour. It was, however, found that that consumption of gas was far too low, and that better results might be obtained by somewhat increasing the quantity. Accordingly the photometrical trials were made with a consumption of 26 cubic feet per hour.

The results of the experiments were adjusted, by calculation, to 16-candle gas, and to a consumption of 26 cubic feet per hour.

Ten complete photometrical estimations were made, the mean result being that the burner, corrected to 26 cubic feet of 16-candle gas, gave the light of 144.9 standard sperm candles of six to the pound.

This is a remarkably good result. It shows that every cubic foot of gas was giving light equal to that from 5.5 candles; whereas, so far as I am informed, the highest amount of light developed by any burner of this class does not amount to more than 4.7 candles per cubic foot of gas.

If the results obtained with the Siemens burner be compared with the published results given by the most effective of the large burners, it will be seen that the former produces a considerably increased development of light from gas of a given value.

The mean pressure of the gas in the above experiments was 0.43 inch at the point of ignition.

T. W. KEATES, F.I.C.,

Consulting Chemist to the Metropolitan Board of Works,
Superintending Gas Examiner to the Metropolis, &c., &c.

A PLEA FOR SUBORDINATE OFFICIALS.

SIR,—As Christmas is once more at hand, and being the season when the salaries of officials of gas companies are revised, may I ask your interest in favour of the subordinates, and their more adequate remuneration? I use the words advisedly, for I believe in no other industry is so much expected and obtained at so low a scale of payment.

It is true that many chief officials of large companies are in receipt of handsome salaries; and it is equally true that directors are only too apt to generalize from the particular, and consider the appearance of

two or three large amounts at the top of the salary-sheet as compensation, by some occult means, for the swarm of little items below. But it is a case of "a pike among the minnows," and I do assure you, Mr. Editor, on the part of the subordinate officials, that this reflected benevolence in no way helps us with the butcher and baker, or eases us in what, in the most of our cases, is a struggle to make both ends meet. Of course we cannot expect the governing bodies to see our case in the same clear light as we do; but there are many reasons why they might, with interest to themselves, favourably consider the question.

Take the case of an underpaid clerk or book-keeper, surrounded with opportunities of being dishonest. A naturally honest man reduced to the most miserable state of existence—poverty, poverty—yielded to temptation, escapes for a considerable period, perhaps; but is finally detected. Here we have a life ruined, and often very considerable loss on the part of his employers. Again: it is well known that an assistant engineer is to his chief as the first lieutenant is to the captain of a man-of-war. He—the assistant—is responsible to his chief for the economical administration of the affairs of the works, which in many cases is no slight matter, involving the control of several hundred men; and, as he generally has the taking on and discharging of hands, it will be seen what an influence he possesses over the expenditure when it is remembered that one man more than is necessary means a loss of at least £50 a year.

In no better case is the manager or engineer of a small or medium-sized works. The whole year round from morn till night—perhaps with the exception of the few days he gets to attend the meetings of the Association—he devotes the whole of his time and energy to the benefit of his employers, for often less than is paid to a mechanic. Surely responsibility should be of some appreciable value! It may be said that I am putting in a plea for dishonesty, and that this is taking the form of a threatening letter; but as such I do not any way intend it, and do heartily and sincerely believe that to your office there is anything in the country, with few exceptions, will fill their duties honestly and to the best of their abilities. I have simply stated what has happened, and, doubtless, will again happen; and, although an increased salary will not make an honest man of a rogue, yet remembering

"How oft the sight of means to do ill deeds,
Makes ill deeds done,"

temptations of many kinds have little power with those who can afford to be honest.

I must apologize for taking up so much of your space, and hope our respective boards and gas committees may wish us "A Merry Christmas" in the way we would most appreciate.

Dec. 17, 1880.

ONE OF THEM.

DR. ADAMS'S GAS STOVE.

SIR,—We note, in your issue of the 7th inst., that Mr. Donny Lane states that his authority for quoting an alleged report of Mr. Bruce conjointly with Dr. Adams, on the efficiency of the latter's stove, was founded on the following statement published by us:—"As a means of comparing the results obtained from this, with those obtained from other stoves, we annex particulars of tests made by Dr. Adams and Mr. L. Bruce. We fail to say that there is anything in the quotation to lead Mr. Lane to infer that it was a joint report, or, indeed, a "report" at all. This error on Mr. Lane's part is emphasized by the fact that Dr. Adams and Mr. Bruce have already, in your columns, repudiated the alleged report.

The real point at issue, however, is: Are the claims, or rather the definite statements of Dr. Adams, given in his paper, "certainly exaggerated," or can they be verified and corroborated by others? For our own part, and from a long series of experiments, we vouch for the accuracy of Dr. Adams's tests, that, with Glasgow gas, 51,800 units of heat were utilized per cubic foot of gas consumed. The result is not equally good with Birmingham gas, though the difference is not so great as to bring it even nearly within the limits which Mr. Lane insists upon.

As one of the "old makers," we fear we must plead guilty to having been "very much in the dark," if by this it is understood that we have been and still are unable to prophesy or practically anticipate all possible advances yet made, or to be made in the future. But we feel no more shame in acknowledging this past ignorance than all the "old makers" of street-lamps should feel if it were alleged that they had been "very much in the dark" because such splendid lanterns as those manufactured by Mr. Suggs, Messrs. Bray and Co., and Messrs. Edison and Swan, &c., have recently been introduced. In Mr. Lane prepared to say that an absolute standard has been fixed, upon which it is impossible to improve? A reference to the history of gas lighting will, we think, show that this is not the case. For instance, the standard test burner described in the Metropolitan Gas Act, 1860, would hardly now be considered the acme of perfection. If, then, the standard of light has been surpassed, why should not the standard of heat? The stove known as the "Imperial" gave, we believe, better thermal results than any other, until the introduction of Dr. Adams's stove; but we are free to confess that in comparison with the latter it is left far behind.

Dr. Adams, in his letter in your issue of the 7th inst., has gone very fully into several points of issue raised by Mr. Lane; but there is one point overlooked, to which we should like to call attention. We refer to Mr. Lane's remarks relative to the value of radiant heat developed in the stove. From his remarks it is clearly evident that Mr. Lane is not familiar with the construction of the stove, or he would see that it is specially designed to utilize this radiant heat. The mass of incandescent material placed centrally at the bottom of the stove, is surrounded by a portion of the walls of the base of the stove, and it is these walls that receive the rays of heat and warm them, and they in their turn impart the heat by contact to the air which is admitted into the stove, and with which the walls are freely bathed. It is an altogether mistaken notion on the part of Mr. Lane that this chamber, heated by radiant heat, is shut off from the external air. The external air flows through the hot-air chamber at the base of the stove as freely as the outer air flows into the entrance hall and passages of a dwelling-house when the outer door is opened. And if there is a powerful open fire in this entrance hall, warming the walls, &c., by radiant heat, then the

entering air is warmed by contact with them. This is precisely the case with the stove, and the value of this conversion of *convected* into *radiant* heat lies in the fact that by this means the heat is localized at an early stage, and immediately utilized. Under other circumstances, there is a mass of hot vapours which can only usefully impart their heat to a heating surface if that surface is of great extent, or if carried along a due of an impracticable length, which is always unsightly.

We would suggest that Mr. Lane should test the stove, and let your readers know the results he arrives at, for without question it must be a subject of great interest to them that a matter so important as the upholding or upsetting of the standard thermal unit power of coal gas should be fully investigated. There cannot be a question of Mr. Denny Lane's competency to deal with the subject, but we venture to suggest that he has erred by adhering to the theoretical standard rather than testing the apparatus, and satisfying himself, by practice, whether or not that standard had been eclipsed.

Birmingham, Dec. 10, 1880.

JOHN WRIGHT AND CO.

Sir,—In your issue of Dec. 7 I corrected certain erroneous statements made by Mr. Denny Lane; and I so discussed the practical issue raised by him, with regard to the amount of heat obtainable from coal gas, as to demonstrate that he was altogether ill-informed on the subject. Mr. Lane, in a further communication, in your JOURNAL of Dec. 14, leaves it to be gathered that in his reference to "the report of Dr. Adams and Mr. J. L. Bruce," he was in reality referring to some observations made by a third party in a contemporary periodical, and was therefore, as I indicated, altogether in a delusion regarding a "report," which existed only in his own imagination. Mr. Bruce has added his corroborative testimony to mine, and it is difficult to understand how, with ordinary prudence, any person could form, and so unguardedly act upon the conviction that led Mr. Lane astray. I further transpire that it is from the same commentary of a third party that Mr. Lane has professed to "Dr. Adams and Mr. J. L. Bruce," the very words of Dr. Adams; for, to make his allegations trustworthy, he gives a sentence in inverted commas. As he expresses no contrition for his offence, I again characterize his pretended quotation as a pure fabrication.

Mr. Lane's error as to the figures representing the specific heat of air, in which he was corrected by Mr. Bruce and myself, is, I admit, a very trivial matter, and I was only induced to refer to it because I found, in tracking Mr. Lane from one point to another, that he seemed to lack accuracy at every point he touched. But he is a man difficult to instruct, for he expressly declares he is not grateful for being corrected in his erroneous statements; that air can be "burnt," and the very words of Dr. Adams; for, to make his allegations trustworthy, he gives a sentence in inverted commas. As he expresses no contrition for his offence, I again characterize his pretended quotation as a pure fabrication.

Mr. Lane has become so confused in this discussion that he has committed the amusing blunder of confounding his own identity, and merging it into mine. In your JOURNAL of Nov. 23, he said 1 lb. of air at 62° = 13.156 cubic feet, and made his calculations accordingly. I corrected him in your issue of Dec. 7, and gave the figures 13.14. In his letter in your issue of Dec. 14 he complains that I impeach his accuracy, and refers me with triumphant precision to the very page of an authority where I will find—what do you think, curious reader?—a verification of my accuracy and a proof of Mr. Lane's inaccuracy. So completely has he transposed our persons and our statements, that in telling me I will find 13.14 to be the correct figure, forgetting his first statement that it was 13.156, he innocently adds, "I did not think it necessary to go to the third place of decimals." In his first erroneous quotation it will be observed that he *does* go to the third place of decimals, and that in my correction it is I who have not gone to the third place of decimals. How is such a man to be contended with?

In nibbling over such little side issues, Mr. Lane drops all further reference to the main question *vis.* the potential heating value of gas, which he at first assumed to be 700 units. So far and no farther. But he has evidently been pondering deeply over the question. He tells us he does not agree with Dr. Wallace's experiments and deductions for reasons—well, "for reasons," he says, "which I will at some other opportunity point out." Neither does he agree with Dr. Ure, at whom he points the finger of scorn; and meanwhile he details an experiment of his own devising, performed on himself in an apartment of a given size, where, at the moment he was writing, he tells us he had been "sitting for five hours" with three gaslights burning. From this data it is to be inferred that it was an after-dinner sitting, although he marks against any serious inference by adding that he was, notwithstanding the conditions described, "*mens sander in corpore sano*." These being the conditions, he lays down the proposition: "As Dr. Ure says that 1 cubic foot of gas heats such an apartment 20°, 60 cubic feet must have heated it 1200°." "Strange to say," he adds, "the lead pipes have not melted," &c., &c., and straightway Mr. Denny Lane bursts into the fog end of a convivial song. I freely admit my inability to contend further with Mr. Denny Lane; to serious inquirers on the points raised I make reference to my communication in your columns of Dec. 7.

Glasgow, Dec. 17, 1880.

JAMES ADAMS, M.D.

DR. SIEMENS'S GAS FIRE.

Sir,—Having since the publication of the article on, and illustration of Dr. Siemens's gas coke fire, had one made and fitted to an ordinary fire-grate, it gives me much pleasure to bear testimony to its efficiency. If followed up and made more widely known by gas managers in their several localities, it should prove a source of profit both in the use of gas for lighting fires, and the more extended use of coke for domestic purposes.

To those who have not yet tested the arrangement, I would say, "Try it."

After the coke is once fairly in a state of combustion the gas may be turned out or kept burning very low, at the pleasure of the user; and as the coke gradually burns away, more can be added in the usual mode.

Southampton, Dec. 18, 1880.

S. W. DUKIN.

[A modification of Dr. Siemens's original arrangement is described in our "Notes" column to-day.—Ed. J. G. L.]

Legal Intelligence.

NEWCASTLE COUNTY COURT.—WEDNESDAY, Dec. 15.

(Before Mr. BRADSTAY, Judge.)

ASKWITH v. THE NEWCASTLE AND GATSFHEAD WATER COMPANY.

In this case Mr. H. C. Askwith, 3, Ridley Place, Newcastle-on-Tyne, sued the Newcastle and Gatsfhead Water Company to recover 3s. that had been "illegally extorted" from him by the Company.

The plaintiff stated that he commenced to take water from the Company in July last, and on Oct. 15, while he was absent from Newcastle, a demand note was left at his place, asking for payment of the amount due up to Nov. 1. On Oct. 22 the water was cut off, and on Nov. 26 he applied to have it again supplied to his premises, but the Company declined to do so until he paid the demand note. On Nov. 26 he paid 8s. 9d. for the water supplied from July to Nov. 1, and he also paid, under protest, 7s. 6d. for the water-rate for the full quarter ending February next. He maintained that, as the water was cut off on Oct. 22, and was not turned on again until Nov. 26, the Company were not entitled to be paid for that time, and he brought this action to recover the 3s. paid for the 36 days, and which he said was "illegally extorted" from him. He also stated that he had read in the Company's Act that they could not charge the water-rate in advance for water supplied to business premises, unless the occupier signed an agreement to pay in advance. His premises were solely used for business purposes, and he had never agreed to pay in advance.

Mr. G. ARMSTRONG, who appeared on behalf of the Company, stated that one of the conditions of their Acts of Parliament was that the contract between a person taking water and the Company was an annual contract, to continue until the parties determined by notice to discontinue. The plaintiff had taken water in July, and had never given any notice to discontinue the contract; and the water-rate was to be paid quarterly in advance on the first day of February, May, August, and November. If a person entered during a quarter, the Company were by law entitled to charge for the full quarter, but the plaintiff had not given notice to discontinue the water. The plaintiff had paid the rate, and the demand note stated that the rate had been twice called for, and that unless paid within three days the water would be cut off. On Oct. 22 it was cut off. The Company had exercised their right to stop the supply, and under the provisions of their Acts the plaintiff must pay.

The Judge said the demand note left at plaintiff's premises on Oct. 15 stated that the water would be cut off if the rate was not paid; and, the money not being paid, the Company had a right to cut off the water. He gave judgment for the defendants.

The Plaintiff asked to be allowed to appeal against this decision, but the Judge declined to grant leave.

Miscellaneous News.

THE SHEPPY GAS-WORKS VALUATION.

SURVEYORS INSTITUTE, WESTMINSTER.—MONDAY, Dec. 13.

(Before Mr. J. CLUTTON, Arbitrator.)

SHEPPY GAS COMPANY, APPELLANTS, v. THE GUARDIANS OF THE SHEPPY UNION AND THE CHURCHWARDENS AND OVERSEERS OF MINSTER, RESPONDENTS.

This was a reference from the Court of Quarter Sessions for East Kent, to determine at what amount the Sheppy Gas Company should be assessed to the Sheppy Board of Guardians, acting as the Assessment Committee, for their works situated at Sheerness. The case as heard before the Justices was reported in the JOURNAL for Oct. 26 (see ante, p. 650).

Mr. H. H. MICHAEL, J.C., and Mr. F. O. GUY, Esq., appeared for the Appellants. Mr. E. J. GUY, Esq., for the Respondents.

Mr. MICHAEL, in opening the case, said by the order of reference the Arbitrator was to report as to the assessable value of the Gas Company's property, leaving the question of costs to be subsequently decided by the Court of Quarter Sessions. The name of the Assessment Committee in gross was £1800, and the residual value £1495, the previous rateable value being £623 10s. The Sheppy Gas Company was first established as a limited liability company in 1857, and commenced to supply gas in 1859. In 1871 they obtained for the first time a special Act, in which was incorporated the Gas-Works (Special) Act, 1847. The capital authorized by the Act was first £4000, upon which 4 per cent. dividend might be paid, and there was power to raise a further £21,000, bearing 10 per cent. dividend. The absolute amount of capital raised at the time was the £4000 in "A" shares, and £19,743 called "B" shares, the total authorized dividend being £2194 as the maximum. Finding the law as it stood with regard to the hypothetical tenant, he thought there would be no difficulty as to what were really the questions to be decided. They were, first, to take the amount of the gross revenue received for gas, residual products, and meter-rents, and from this to deduct the cost of materials incident to the production of gas, and by this means they would arrive at the net profit which the Company could earn. But when they came to consider the question as to what the hypothetical tenant would give in the way of rent, they must go back to the decided cases, and then consider what were the proper deductions to be made. The first point to be discussed would be what was the amount of working capital which would be required to carry on the business. The Court clearly laid down the principle that it was left to the Quarter Sessions, and therefore to the Arbitrator, to determine what was the proper amount of capital which such an imaginary tenant would require to have in order to carry on the works. The principle he should lay down was very easy to comprehend, and he carried out the business of the tenant, by the Gas-Works Clauses Act, 10 per cent. was the limit of profits, 17 per cent. should be allowed of what might practically be said to be profits, although they were not really so; but it must be remembered that the 10 per cent. was a sum carried over the whole capital of the Company, which had been expended and must be carried back to the original capital, and was, as a going concern, and to replace such parts as of necessity must become worn out. Therefore, it was not 17 per cent. calculated over the capital, but on the comparatively small amount of it which was represented as simply the working capital, to enable the imaginary tenant to carry on the concern. There would be questions to decide, the first—first, what was the amount of capital which should be in the possession of an imaginary tenant to enable him to carry on the concern; secondly, what should be the amount deducted from the total amount as net

revenue. Having found this, the Arbitrator must decide what was the amount which should be set aside from year to year by the imaginary tenant in the way of statutory deductions, to replace the works so as to keep them in the condition to earn, from time to time, an amount of profit which was to recoup him for the expenditure of his time and capital. He must first find out what the sum of money which he was entitled to have such a sum as would keep the works in a proper condition to earn the amount of profit which was to recoup him. It would be necessary for the Arbitrator, when looking at the photographs and considering the evidence, to find out what was the state of the works, and that the works were in the very best state of repair, and required an immediate expenditure upon them of some considerable capital. When he (Mr. Michael) said this, he did not mean capital which could be taken out of the Company. It was a well-established fact in the conduct of gas works that the works must be kept in a state of repair, and that it became *quasi* trustees for the public, and any profits which might be earned beyond those required for dividends were to go back to the public in the way of a reduction in the price of gas, and any cost of replacement of works of a structural character could not be met by raising new capital, but must be met by the profits. The sum which was to be set aside, in the head of statutory deductions, was the proper amount to lay aside year by year in order to keep the works in such a proper going condition as to earn the profit. The peculiarity of the case was that the works were in a state of extreme deteriorating character, and they were at the present time in a bad state of non-repair, the soil being also of a character extremely unfavourable to the duration of the pipes placed in it. Evidence would be given as to the average life of such works, and as to what amount, spread over a certain period of years, would be required to replace the works. The sum of money which, having made these deductions, they would arrive at a net sum which he said was the net rateable value, and should replace the sum of £1400 fixed by the Assessment Committee. He did not gather that the accuracy of the Company's accounts was disputed; they would show the main features—namely, the amount of capital required, the amount of profit, and the amount of capital required must be taken from skilled witnesses. The amount of percentage was given in the case of *Reg. v. Inhabitants of Lee*—namely, 1/4 per cent., an amount which had been subsequently allowed

Mr. CASTLE, on behalf of the Respondents, said he would admit the accounts of the Company.

was examined by Mr. CASTLE, witness said that the trade account showed the complete four quarters rental, irrespective of the question as to whether the money had been collected or not in the year, whereas the statement of income and expenditure simply showed the cash received on the account during that period. The trade account for 1879 showed a gas rental of £7154, from which £431 was allowed for discount. Besides this there was a deduction of £50 for bad debts, of which perhaps £40 was due to gas rental. The net gas rental was £6683. The total cost for coal was £23186 17s. 11d., and deducting the amount received for residuals, £1140 15s. 2d., and £10 for bad debts, the net charge for coals was £17836 7s. 2d.

Mr. E. Ryde, examined by Mr. MICHAEL

I am a Land Surveyor, and a Member of the Institute of Surveyors. I have made a valuation of this property for the purpose of the rate. The basis of my calculation was the trade account of the Company for 1879, as representing their work for the period over which the account ran. I took the value of the works of the concern as the basis upon which I calculated what an imaginary tenant would have to pay for the works. He would have to pay £1735, including for meter-rents, fitting, and stove-hire, £220. I deducted £50 for bad debts, and £432 for discount, leaving £6893. The cost of coal and lime was £3232, and deducting from this £1463 received for the use of the premises, I had £5430. I added £100 for the cost of wages, £477 for salaries and commission, £461 for office and incidental expenses, £30 for law charges, £100 for Directors fees, £15 for Auditors, and £207 for rates and taxes, the total working expenses came to £5317, which, subtracted from £6939, left a net receipt of £3376. Having found the gross profit to be £3376, I estimated the net expenditure of a tenant would require to work the concern. I first assumed that a tenant, in order to be in circumstances to enable him to carry on these works, must have capital enough to pay five months working expenses. He must go on for three months before he could make any charge for the work he supplies, and he must make two months' advance for any appreciable amount of money in. I estimated one month's expenditure at £5234, and taking 5-12ths of this gave £2108 for the five months. I took 870 meters at £2 each, making £1740, the fact being that there were 970; £530 for coal, because the tenant ought to have at least £500 in his hand to meet contingencies; £250 for stores; and £300 for cash at bank to make £3820. This was the amount of capital which would be absolutely required by the imaginary tenant to carry on the undertaking, and it would be reasonable even to extend it by putting in a quarter's rent, for he would have had to pay £1000 5 per cent for the first, 10 per cent. for trade profit, and 5 per cent. for cash at bank, and I estimated the net expenditure from £3876, left £2448 as the gross estimated rental of the premises. It is obvious, from the appearance of the works, that they have not been kept in a complete state of repair, and therefore any reference in the accounts to what had been spent on repairs might not be any guide as to what a tenant, wanting to carry on the works, would have to pay for repairs to lay out; I have therefore looked to see what the expenditure has been on other works. I put the repairs at £1015, and in arriving at this sum I used the experience I have gained in carrying on my business as a Surveyor. The property is in a very bad condition; it was probably badly built, and the foundation and the work of the stone is in a state of total dilapidation. I should consider that the works require to be rebuilt at once. Assuming the cost of the works to be £20,000, and giving them 20 years life, the Company would require to provide a sinking-fund of £650 a year. Adding £20 for insurance, the three sums give £1950 to be deducted from the £2448, leaving £498 as the net rental value, and I do not believe any tenant would take the works at this rent.

Cross-examined by Mr. CASTLE: I have had a great deal to do with gas-works, but cannot call to mind an instance in which I have let them. I have been concerned in the sale of many—for instance, the Dundee Gas-Works—but have not built works.

Mr. CASLIE said he was instructed to admit the working expenses, \$3617, and \$3376 as the net receipts. The real question between the parties was what should be allowed for the occupier's share and for statutable deductions.

Cross-examination continued: The 17½ per cent. for the occupier's share is a question of fact which the law has recognized. The amount for the landlord would be found weekly, fortnightly, or monthly. I have not allowed anything for the sale of residuals, because I could not depend upon selling them in the five months and getting the money. When the hypothetical tenant sells his residuals, he often has to wait for the money. He would not be paid for them faster than he would be paid for his gas.

He would often accumulate a stock of coke. The £350 is an estimated amount for retorts. I did not look into the accounts for the previous year; I looked at the retorts and asked questions about them. The capital put into the business to work it must always remain there. The business could not be carried on by a tenant who had to pay rent unless he had command of £5000. My £300 is a small amount to be kept at the bank.

Mr. CASTLE: You are allowing the tenant 17½ per cent. not in the case of a railway, where a man turns all the money into rolling stock, but simply because he wants some money in advance to pay for these different items which will come back to him as money in the way of business?

Witness: First as to the 5 per cent., the tenant gets no profit at all. As to the 2½ per cent. the tenant never gets it—it is a contingency-fund to secure him the 5 per cent. and 10 per cent. All the tenant gets here is 10 per cent.; that is the profit he makes out of the concern.

Cross-examination continued: The sum put down for meters is too small; it will be proved to be a larger figure. I have not seen the meters, but the £2 each is the best result of the combined wisdom of three or four gentlemen, who thought the meters were worth this amount on an average. I have not seen the receipts, but I have seen the sum put down for them. If the receipts do not come up to the mark, or the expenses exceed the amount, this is the only sum out of which he can get an indemnity. As to maintenance, the amount expended during the last few years is not given to the public. I have seen the accounts, but I have not seen the command the rent, though they do the work after fashion. For some years the works have done their utmost duty in every sense of the term, and they would not do much more. They will go on till they break down completely. They are not safe now. I say the Company ought to begin directly to repair next week or next year. I do not mind that they are not done.

diate danger of coming down, but they are in a very bad state. The yearly manufacture is 34,871,000 feet of gas, and I put the repairs of premises at 7d. per 1000, which works out to £1015. It cost the London Gas Company £1000 to build a gas main, and I estimate that the average value of the works to build and their life has been practically proved to be 20 years. This represents everything—gas-works and appurtenances—£7000 for buildings, £7000 for plant, and £6000 for mains. They all, more or less, are wearing out. The Company will have to spend £1000 within the next two years, and another £1000 at once. A larger sum than the average must be expended upon the retorts this year, for they have got into such a condition that the average of £350 a year for the next 10 years will not keep them going. Some of the buildings and mains are worn in ordinary gas-works, but in the buildings and mains at 40 years life, the gasholder at 25 years, and the valves and so on at 15 years. I should put the retorts at about two years life; they are burnt out as fast as a pickaxe. If the mains will be predicted to last 20 years, and the retorts 2 years, if the mains have not lasted 20 years, at Weymouth a gas engineer attributed ten years life to some of his pipes, where they were close to sea water. There are many pipes and things about gas-works that are worn out and taken up as fast as the retorts, and they are worn out, because they have become totally unfit for the purpose intended. The ordinary average life of a gas-main is not more than 30 years. If some of the mains are not worn out, they will probably have to be taken up, and they will not be replaced, and they will probably have to be replaced and they will not be replaced anything to put down again. The period of 20 years is taken at 4 per cent, and the average a year would give £20,000 in 20 years. Though 40 years is the average for gas-works, and 20 years for this case, because the buildings and plant will last about 20 years, and the gas-works 40 years.

Re-examined by Mr. MICHAEL: The Company commenced to supply gas in 1859, and from that time to this day have been extending their works and expending capital. The works require to be renewed *in toto* with the exception of the large gasholder, which has been erected within the last five or six years. If the Company had put by the sum of £66,000 a year from the commencement, they would now have a sufficient sum to replace the works. This is the whole scheme and basis of my calculation.

Mr. MICHAEL: That being the scheme, could the Company do as my friend suggested, go to Parliament and get additional powers to expend £20,000 of fresh capital, and charge the ratepayers with the money so expended?

Witness: I suppose they would have to catch one gentleman—Lord Redesdale—asleep.

Mr. Alfred Penny, examined by Mr. MICHAEL.

I carry on business in Westminster, and for upwards of 30 years have had very large practical experience in connection with gas-works and gas

undertakings. I am also a lessee of gas-works. I have prepared an estimate of the amount at which, in my opinion, these works should be rated, and I think that the rate of £10 per acre would be ample compensation. Mr. Hyde, and made the total receipts of the Company £8276 15s. I took the quantity of gas sold, and charged upon it a certain price for ordinary repairs and maintenance of works, and it brought out the total at £8790 6d. per 100 feet of gas as before. As to the question of repairs and maintenance, supposing the works to have been put properly to begin with, and on such a foundation that they would stand. This is something in excess of the sum the Company have charged. The absolute state of things with respect to the works is this, that the mainstay of the whole consists of the three arches of the bridge, which are supported by four pillars about 36 inches out of the upright, and the retorts, instead of standing level, have fallen back to such an extent that the setters could not go into the arches the number of retorts they were originally intended for. It is impossible to see immediately how it has come to pass that the coal-store adjoining the north-house is simply built up by a number of iron stays, and the whole thing is most dangerous. This has resulted, in the first place, from precautions not having been taken to secure a proper foundation, and next from the absolute badness of the foundation itself. If the precaution had been taken in the first instance, I do not think the Manager would have kept the place right. But it is quite clear that ordinary precautions in respect to such a site were not taken, and therefore the appearance was so defective. I think that if the works had been completed in one day, and the consequence would be that the Company would break all their obligations to supply the town with gas, and the public would suffer. I have seen some of the pipes and mains. The peculiar nature of the soil has thrown them so soft that they can be gouged out with a chisel, and I have now said, taking them all through, you will find it in condition.

TUESDAY, DEC. 14

Mr. PENNY recalled and further examined by Mr. MICHAEL.

The tenant's capital that would be required for carrying on the unde taking would be made up of three things. The whole expenditure for the year being 18907, I take half of that amount, or six months expenditure £2953. To this I add for stores, cash at the bankers, and so on, £900. Then I take the value of 977 meters at £2 each, £1954. These amount added together make 15707—say £5700 in round numbers. The tenant could not do with less capital than this, and it is evident, from the account

of the Company, that they are employing this amount of capital. It appears, from the statement of income and expenditure in the Company's annual accounts up to Dec. 31, that the amount due for gas at that time was £2300; arrears, £139; due for coke, tar, &c., £295—in all, £2734. The stock account amounted to £815, and the cash at bankers to £267, making a grand total of £3826. Then there is the retort expense account—money spent on retorts which it was not thought advisable to bring into the current year. If this is added it will make £4500. Then the probability is that a quarter's rent would have to be paid, and this would be £150 a year more. I think, therefore, I have amply justified my claim of £5707 as tenant's capital. With regard to the meters, I worked out the cost according to the list at £1583, and to this will have to be added the cost of fixing and the material used in fixing. I have put down five shillings each for fixing the meters, which is a low average, and it allows nothing for Government stamping and so on. According to my experience as a lessee of gas-works, it would be impossible to put a lower figure. I have checked my estimate by the actual accounts of the Company, and the amount I have asked is really not more than absolutely necessary. I adopt Mr. Ryde's principle of 5 per cent. for interest on capital, 10 per cent. for profits, and 2½ per cent. for risks and casualties. With regard to the sum I have put down to place the works in an efficient condition, I admit that it is an abnormal sum, and beyond anything I have ever given before; but the state of the case is such that it is absolutely necessary that the sum I have named should be set aside in order to put the works in a condition which a tenant would require them to be in before he would take them. The works were commenced on a limited scale 20 years ago. The retort-house was a very small one, only 25 feet wide, which was perhaps sufficient when the material used was of the best quality. But the work has compelled the Manager to put in very much longer ones. The Company commenced with retorts 7 ft 6 in. long, and those they now have are 10 feet in length. They began with beds of three retorts, and now they have beds of five, seven, and so on. The Company appear to have had no idea of the necessity of putting in more retorts, and the sum I have named is sufficient when they started was totally insufficient and improper as the consumption of gas went on doubling, trebling, and quadrupling. The great weight of the new beds of the retorts has completely pressed down the ground, so that there is a difference of 2 feet and some inches in the level of a wall—that is, the level of the wall of the retort-house is less than that depth. This is a very dangerous state of things, and I understand the mischief still continues. I do not know of another case in which such a state of things as this exists. Any day the town may suddenly be put in darkness. What I think ought to be done under the circumstances is this. There is a corner of the plan a small dwelling-house, which, in my judgment, ought to be pulled down, and the works must be carried on, and a retort-house is a necessity, the site of this house is the only place where it can be put. The building from this point must be cleared away, and a new retort-house and coal-store commenced on this site. There is no other way out of the difficulty. There are two resolutions that I have put down, and I think the probability of them will go down into its tank. One gives 2 inches pressure, and the other 2½ inches. They are totally useless, except for supplying the public lamps after one o'clock in the morning. One holder ought to be cleared away altogether, so as to give a little more yard space. There is no room to stand the coal-store, and the holder ought to be pulled down, and the tank covered in and made a far and liquor tank. Even if one holder were cleared away it would be a good thing; but if it is not taken down it must be renewed. The other holder has been up about 15 years, but it is in good condition; at all events, it is the Company's money—their money—that is paid for the gas. The alterations for the storage of their gas. These alterations would involve the building of a new house for the Manager on some ground the Company have across the road. I have been imagining the case of a tenant, and I say I would not take the works unless they were put in such a condition that I could earn and pay the rent. If the Company had done this, that is, if they had done what they would long ago have put aside money for renewals. The sum I have named is absolutely necessary for the proper conduct of the works. The Company are under certain parliamentary obligations; but they have never had proper advice, or they would not have allowed the works to be put into the condition in which they are. The gas is sold at a price of 40 million feet of gas from such works. "The time must come for renewals of plant, not necessarily because the things are worn out, but because they have to be replaced by larger ones. Where a larger thing is substituted for a smaller one, the surplus is charged to capital, and the rent is paid on the capital. The gas is sold at a price of 40 million feet of gas from such works, and it will be a proper thing for them to spend out of revenue that which they have neglected to spend up to the present time. They have been paying as dividend money that ought to have been employed in keeping the works in a proper condition. They have failed to recognise the fact that the site of their works is an abnormal one, requiring them to put away such a sum as would enable them to pay for the short life of their plant. I have not examined the mains, but I am informed by the Manager that they are in a very perishable condition. In such soils as that of the Company's district, mains soon begin to soften and perish, and when they are taken up they are nearly worthless; in other soils I have known mains taken up in a good condition after lying in the ground for 50 years. A great deal of the ground is made of cinder ashes brought from the Dockyard, and this material tends to destroy iron very quickly, owing to the chemical mixture exuding from the ashes. The rate of depreciation of the works is what I have put down, and it is not, perhaps, that it is more than it ought to be. The time when gas plant was insured at 25s., 21s., or 15s.; but I have heard that there are some Insurance Companies who take this kind of business at 10s., and even as low as 7s. 6d. per cent. Some gas companies insure their works.

Mr. MICHAEL: You have taken for repairs 6d. per 1000 feet of gas?

Witness: That is for ordinary repairs and maintenance. It is only an average sum; it is not a criterion of what should be spent in any one year. This year 8d. or 9d. might be required, and only 3d. or 4d. next year.

Cross-examined by Mr. CASTLE: I have had experience as a lessee of gas-works, but with one exception have given up that sort of thing. I have leased the gas-works at Portsmouth and at Whitehaven, also some foreign works—those at Oporto, for instance. I have never heard of a tenant from my own experience who has put down a sum of £2459 as representing money that would be sufficient to run a company as a tenant, that is without reckoning the meters. I have added a quarter's rent—£150—and if I had to find meters I should require £1964 more.

Mr. CASTLE: Did you ever know a case in which a tenant took over the meters?

Witness: Certainly; it was done at Worthing, where the works were leased for seven years to a Mr. Brothers, who, I presume, took over the meters. Those at any rate were the terms on which the tenders were made. It is not, however, the general custom for lessees of gas-works to take over the meters. At Whitehaven I had to provide all the new retorts during the last 14 years, and not half a dozen years ago I had to provide them. It is not the custom for tenants of houses to provide meters; it

is, however, a matter of agreement. If a company insists upon a tenant providing his meter, there is, of course, so much less rent to pay. There are very few gas-works held on lease; it is quite an exceptional thing. The lessee of gas-works is obliged to do to all that the company are compelled to do by law—that is, to supply everybody who applies for gas—and therefore he is obliged to find meters for the purpose.

You have given a total expenditure of £5907, and I say that half the sum would be sufficient for a tenant to take over the works. Now, according to your experience, is not that absurd?—I do not see the absurdity of it.

The tenant turns over his money four times in the year, and yet you say he must find £2363 as capital on going into the works?—The accounts are very few gas-works held on lease; it is quite an exceptional thing. I must provide it to-morrow. The figures really amount to £4400, but I have only asked for £3753—that is, £2363 and £500.

You assume that the Company's accounts have been correctly kept, and you adopt the figures in one case, but you drop them in the other?—I assume that when a company publishes a statement that they own so much, the figures are correct, and yet the company may not be able to understand the working of a concern like this. It is clear to any one who understands figures that some time or other the lessee of these works must have omitted a sum amounting to £2400. This includes some profit, but then an only saving for £3753. If I took the concern, I should be in the same position as the Company are in; I should be owing so much for gas, and I should require to make the same expenditure.

How do you justify your estimate of six months expenses when the money will be coming in after the first quarter?—What I say is that I have not taken into account the expense of the gas for the first quarter, but I have taken into account the expense of the gas for the rest of the year. It is all at once. Perhaps the tenant begins at Midsummer, which is a light period, and the money is collected for the quarter ending Sept. 30, and is received perhaps before the end of November, leaving some arrears. But during that time the tenant must go on making a large expenditure day after day, and the money is not coming in until the next quarter, and is not collected until February. This is how the money is eaten into not providing all the requirements for the winter quarter. To work the concern properly I should want the whole sum I have given.

Cross-examination continued: Supposing the tenant commenced with a heavy quarter, then he would have more, for he would have two winter quarters to pay for, and it is impossible to start gas-works, say at Christmas, without a good stock of coal. When I went into the Portsmouth Gas-Works, I paid £3000 in taking over the stock. The gas-rental in that case was about £12,000. I had to carry on the works for four months before I was entitled to a shilling. The amount received for residual gas was £1300 a year, and it did not do it. I had to make £60 million feet of gas per annum, and is racked to death by anxiety about the works. The money put down for supervision is too little instead of too much. The actual expenditure put down in the Company's accounts in any particular year does not in every respect represent the sum that should be properly expended.

The estimator: You say that the state of the property shows that the Company have not properly kept up the works?

Witness: Yes; and a large sum is now absolutely required to be spent upon them. This is partly due to the sinking of the coal-stores.

How do you estimate the cost of a renewal of the works?—I am based on the assumption that during the life of the buildings the sum of £680 a year has been put by?

Witness: No; if the Company had put by that sum, the rateable value would be there now. My estimate was £600. I say that £5000 would be required to put the works in a proper condition to start with. Then, having regard to the abnormal condition of the ground, I am not certain, after I have used all the skill that I possess, that the works may not be in a certain time in a similar condition again; that is why I put their life at 20 instead of 40 years.

And you say now, after an existence of 20 years, the amount required is £5000?—I am not saying that. I am saying that the works are in a state of decay, and that you may have had the benefit, for what I know, of the extra rateable value all this time, and you may have had the benefit of the Company not having brought the amount into their debit account. As soon as I have spent the £5000 in one place, I may go on spending £5000 somewhere else, and probably I shall want to do it. Looking at the whole value of the structure as if it was new, I find it comes to about £20,000. According to my judgment the life of these works will only be 30 years.

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Then do you mean to say that if the tenant, instead of expending £130 or £140 in repairs, expends the extravagant sum of £500 during the next year, at the end of that period £20,000 will be wanted?—Yes, it is possible.

Cross-examination continued: There are 61 retorts; about 50 are lighted in the winter. As to the £5000 required to be spent, there would be for pulling down and rebuilding the retort-house, and re-erecting 60 retorts, and the old retort-house, as far as the £5000 is concerned, £2400; pulling down and rebuilding store to contain 1000 tons of coal (using the old materials), at 14s. per ton capacity, £700; reinstating 20-foot gas-holders, £1000; rebuilding Manager's house, £350. The governor-house requires to be rebuilt, and the apparatus requires setting up generally, £200; estimate the cost of the £500 or £700. These items added together will make a little over £5000. I say that during the next 20 years there will, in my judgment, be a necessity for spending £20,000 upon the works, and the mains and services will have to be replaced by additional ones. During the last 20 years the business of the Company has been growing very rapidly. The works are now producing 100 million cubic feet of gas annually, and the business is growing. The amount spent on repairs and maintenance by the London Companies is £65d. per 1000 cubic feet.

Re-examined by Mr. MICHAEL: The Company began with a very small sum, and the works are very insufficient for the present demand. Some portions of them are not 20 years old; the different parts have varying ages. If the works had been properly managed, they would require no such sum as I have now mentioned. If a sum of £650 a year had been spent upon them, they would have been kept in a state of efficiency, a considerable period is occupied in taking the state of the

meters, making out the accounts, and collecting, and during this period money has to be expended. I consider the sum I have named as rather under than over the amount that would be required.

Mr. R. P. Spice, examined by Mr. MICHAEL.
I have had experience in all matters connected with gas-works for 80 years. I have seen the works of the Sheppy Gas Company, and they are in a state of extraordinary dilapidation, calling for an immediate expenditure of money. I agree substantially with the calculations of Mr. Penny. The statement actually sent by the Company for repairs and maintenance have not been sufficient; the present state of the works is evidence of that fact. The ordinary cost of repairs and maintenance throughout the country is about 6d. per 1000 cubic feet; in London it is 5d. and a decimal. I take one-half of the annual expenditure as the amount of capital required to undertake the works. Like Mr. Penny, I have been a lessee of gas-works, and I have not taken over the meters. I should not, however, advise a company to let their works without requiring the lessee to take the meters. About £5000 would require to be spent on the works at once, and it will require an expenditure of £600 a year for several years to come to put them in a proper condition. This is in addition to the ordinary maintenance expenses. I have here a portion of a pipe (produced) taken up from Hope Street, Sheerness, and you see the state it is in. Its age is under seven years. In such soil the mains are rapidly destroyed; and this, of course, greatly increases the expense of repairs and maintenance. Mains generally represent one-third of the whole capital of a gas company.

Cross-examined by Mr. CASTLE: I have never found capital for meters; I have had to take them as they were, under an inventory, and have had to find new ones as the new ones were wanted and the old ones. At the end of the term the new ones were paid for by the Company. The chances are that in ten years nine out of ten of the meters will have been paid for by the tenants, the old ones having been worn out. The life of a meter is only 10 or 12 years. The expenditure for repairs does not vary much, depending upon the amount of gas made; it depends upon various surrounding circumstances. In a small concern the cost per 1000 feet will be more than in a large one. The amount varies in the London Companies from 7-6d. in The Gas Light and Coke Company to 3-6d. in the South Metropolitan Company; and the estimate is not misleading if you take the average.

Mr. CASTLE then addressed the Arbitrator on behalf of the parish. He said Mr. Ryde had taken £8693 as the receipts for gas and other rentals, and the Respondents adopted this figure. He had taken £3317 for the expenses that the tenant would have to incur; this included a sum of £207, which (he Mr. CASTLE) proposed to take out and deal with later on, leaving, therefore, a sum of £8486 for the Respondents. There had been a deal of discrepancy between the figures adopted by the Company and those given by the witnesses. Sometimes the Company had been taken to be the tenant. The law said nothing about a "hypothetical" tenant; it said a tenant, and this tenant might be the Company, just as a person might be both landlord and tenant. The works had to be rated as being occupied by a company and not by an imaginary person who came in and wished to make all sorts of extraordinary changes which a company would never think of making. Mr. Penny and Mr. Spice had not adopted Mr. Ryde's figures, for they had not allowed for the residual products.

Mr. MICHAEL remarked that they had allowed for them, but the account was made out in a different way.

Mr. CASTLE said Mr. Spice and Mr. Penny had charged a gross amount of £3186 for coals, and had not taken off the residuals as Mr. Ryde had done. Mr. Ryde had followed the proper course of giving a total of £3317 for the Company's expenses, instead of £3908. It was true that the amount for residuals was shifted from expenses to receipts; but Mr. Spice and Mr. Penny claimed 17½ per cent. upon the money which had not been deducted from the expenses. They had given £370 for repairs, but this was inadmissible, since in a year and a half the old meters and the old apparatus—repairs were not paid for by the tenant. These corrections would bring the figures of Mr. Spice and Mr. Penny down to Mr. Ryde's estimate of £3517. The real sum to be divided between the landlord, the tenant, and the parish, which was the real division in all such cases, was £3693, and this division was not made. It was true that the amount for coals was the occupier's share as £927; the Respondents had put it down at £455. Mr. Ryde took £534 as the tenant's expenses in the year, which differed from the amount previously given, and he justified it by adding the residual products—in fact, he did not take them off. He drew a distinction between the tenant's expenses and the expenses of the parish, and the working expenses. The Respondents figure was £3310, and the proportion 44 months, or three-eighths, which amounted to £1350. They did not allow anything for meters. If a tenant with a long lease did not find capital for meters, *a fortiori* a yearly tenant would not. They would be simply valued to inherit. The Appellants adopted Mr. Ryde's sum—£3300 for two months stock of coal; for tools and stores they allowed £300 instead of £200; and cash at the bankers, £300. The total was £2580 instead of £3500. They allowed 17½ per cent. upon the tenant's capital, it being a common error of surveyors that this amount should be allowed, although there was no justification for it. This percentage gave £455 as opposed to Mr. Ryde's figures. Deducting the £455 from £3310, there was left a balance of £2855. The amount to be set aside for repairs and renewals together was £665, instead of Mr. Ryde's extravagant estimate of £1695. As to the £5000 said to be required as a present expenditure, there was no foundation for it, except for a couple of feet, this suggestion was absolutely without foundation. According to the report of the Directors of the Company, the premises had been kept in a proper state of repair; but, even if the wall had sunk, a few hundred pounds would suffice for the necessary repairs. The Appellants, however, talked about £600 for a renewal fund, and £1000 for the stock of coal, and the Arbitrator had to consider the tenant actually in possession, and not what a new incoming tenant might possibly want. The total rateable value of the works, according to the contention of the Respondents, was £1932.

Mr. Henry J. Castle, examined by Mr. CASTLE.
I have made an estimate of the value of the Sheppy Gas Company's works for this year, and I have taken some of Mr. Ryde's figures, though I may differ from him to a small extent, thus leaving open points for the consideration of the Arbitrator. I take the figure of £3583, but I leave out the £207 for rates, because I am bound to allow a larger sum at the end. That is the only difference between us as regards expenses and the net receipts. The first point of difference is as to the tenant's profits. Mr. Ryde makes the amount £927; I make it £455. I take Mr. Ryde's figures with regard to coal, but I strike off the residuals; and this constitutes the difference between £3187 and £1345. Upon the total, in round numbers, of £3500 Mr. Ryde has taken 5-12th; I have taken 3-8ths as a difference, and £2440. I do not think it is necessary to report on the ground that the tenant is not required to find the money to pay for them. I allow for two months stock of coal, and for cash at the bankers. Mr. Ryde makes the tenant's capital £5300; I make it £2600. I have always adopted the proportion of 3-8ths. It will be found that £400 is allowed by way of discount because the money is paid immediately. The Com-

pany actually hold deposits upon the accounts, upon which they allow 5 per cent. interest. Under those circumstances, I do not feel justified in increasing the 3-8ths. I allow 17½ per cent. on the tenant's capital. The deductions and allowances I put at £665. For repairs I allow £269 as the money usually spent for the year in ordinary repairs, without taking into account that portion of the works which may have been for work done upon repairs. I have adopted Mr. Ryde's values of £7000 for apparatus, £7000 for buildings, and £6000 for mains. I have also adopted his 4 per cent. tables. The difference between us is the number of years of life that I have allowed. I have taken the buildings at 40 years, and the apparatus at 10 years, and the mains at 20 years. I cannot say these are particularly first-class buildings, and I have taken them at 40 years. I have known retort-houses that will last 100 years, but they are not this class of building. I have allowed 20 years for the apparatus, the same amount of life as Mr. Ryde has taken as an average, so that as regards this item I adopt Mr. Ryde's figures, and I have told the works had been built 20 years. I saw upon one of the buildings an iron plate having upon it the words: "Built in 1858," and I accepted the fact; therefore some of the mains and pipes must have been down for 22 years. For the mains I allow 40 years life; that is about the ordinary life we allow, as a rule. It is a very short life; under ordinary conditions, for gas-mains. The Respondents proposed I do not think I should have put down at less than 40 years of age. Supposing it to be a fair specimen of some pipes in very bad situations, I should not be at all disposed to modify my view in consequence of this. I have not made a distinction between the life of the mains and the pipes, as I do not think it is necessary to provide for the replacement of service-pipes, because the life of a service-pipe is so small; it is generally allowed out of ordinary expenditure. I add insurance £35, and make the total deductions allowed £665. That gives the total £2463, from which the rates have to be deducted. Deducting £591, being at the rate of 5s. 6d. in the pound rates value, you get £1872 as the net value of the works, and £490 of this amount lies outside the parish of Minister, so that this must be deducted.

Cross-examined by Mr. MICHAEL: I prepared this statement last night.

I made a statement for the purpose of advising the Assessment Committee, but it does not correspond with this one. The basis upon which the rate has been made is not this statement. I cannot give you the original statement. It was made at the time I was in general ignorance of everything, and was for the purpose of arriving at a valuation to be afterwards settled.

Mr. MICHAEL: Shall I say it was a statement entirely different from the statement you put forward?

Witness: Oh, no; not entirely different.

You do not mean to say this statement at all accords with the statement upon which the rate has been struck?—It is above it.

The amount put in the rate is £1490; this is £1932. Do you not think I intended to ask you how this difference arose? Did you not send in a statement upon which the Company were rated at an assessable value of £1490?—I do not know what you mean by a "statement." I signed a valuation for £1490, which the Assessment Committee adopted.

And you bring in a net statement before the Arbitrator for £1932?—I do.

Which is the correct one?—Neither the one nor the other. You cannot make an estimate mathematically correct at all. I invariably knock off 10 or 15 per cent. from my valuation, in order to guard against points with which I am not acquainted.

What is the difference in percentage between that which you present to-day to the Arbitrator, and that which formed the basis upon which the rate was struck?—About 25 per cent.

Cross-examination continued: In order to ascertain the value before I sent in my valuation, I went over the works and applied for the yearly rates for the accounts of 1878, and I found two statements—one of income and expenditure, and the other the trade account. The items not agreeing, I was obliged to founder my way till Mr. Spice and I met. I was obliged to adopt the item of £515 for repairs and renewals in my first estimate, because I could not subdivide it; but as soon as I found what the correct figure was, I did subdivide it, and I did state out a portion of the account because it had not been absolutely expended. I have taken the actual repairs that I found in the accounts during the last year—the absolute money expended, £285, which was not enough to keep the premises in sufficient repair as landlord. I allow £360 as the yearly expenditure. That is the correct figure, and I have brought out the value spread over the landlord or the tenant, or at all events it ought to be put aside as a sinking-fund for drawing upon when required. The £269 is for repairs, and £360 for renewals. I do not know how many retorts would require to be renewed every year.

SATURDAY, DEC. 18.

At the meeting of the parties to this case to-day, Mr. Castle was recalled, and produced a letter which he had received from the Secretary of the Company, enclosing a balance-sheet for 1877-8, and stating that the yearly accounts for 1879 were not completed. His estimate, he said, had been based on the account of 1878, but he had not been able to find it. Neither the original estimate nor the present one was quite right. The 1878 account was based upon the figures for 1878, which had ceased to be applicable. As to the subsequent estimate, based upon the 1879 figures, this was a question for the Court. He would not assume that it was right—perhaps it was wrong. He thought it was fair, but he would not say it was right.

Cross-examined by Mr. MICHAEL, witness said he could not state the date of his appointment to make a valuation for the parish, but it must have been before January last, because this was the date of the letter.

Mr. MICHAEL called attention to the fact that the valuation which was produced, and a minute was read from it, dated March, 1880, asking the terms upon which the witness would make a valuation.

Witness said he could not explain the statement that he had been appointed before January, when he had been asked in March what his valuation would be for the year. He would not undertake to say what was the time of his appointment.

Mr. MICHAEL: You say you could not get the accounts in January. You were appointed to do the work on the 31st of March, and the accounts were published before that time.

Witness: I do not know.

Did you ever visit the works before the valuation was sent in?—I really do not know. The firm did; whether I did personally I cannot tell.

Re-examined by Mr. CASTLE: Having had the opportunity of refreshing my memory, I suppose I did not make the valuation until after the 31st of March.

Mr. G. W. Stevenson, examined by Mr. CASTLE.

I have been an Engineer 35 years, and have had considerable experience in reference to the rating of gas-works. I have estimated the rateable value of this property, and have proceeded on the assumption that the balance-sheet of the Company shows the expenses which the tenant will have to undertake. I presume that a gas company knows how to manage its business in the best way. I have taken the working expenses, £4309, from the balance-sheet, deducting residuals. Tenant's capital I take at three-eighths of the expenses, £1618; coal and lime, two months, £557; stores and tools, £400; half rates and taxes,

£295—total, £2774. I have given the occupier 174 per cent. on this amount—£485—leaving £2909 as the gross estimated rental. I find, on looking at the accounts for 1879, that the whole working expenses, excluding the cost of raw material, amount to 174d. per 1000 feet of gas. I have looked at the expenditure of some of the Metropolitan Gas Companies for repairs and renewals generally (they may be distinguished into the main, and the branch), and the 174d. is in excess of what the South Metropolitan, or the Gaslight and Coke Company, have ever spent for repairs and renewals. In 1879 the accounts not only include current repairs, but £125 for rebuilding a shaft, and £130 for depreciation. In 1870 the Company spent £166; in 1871, £182; in 1872, £161; in 1873, £102; in 1874, £115; in 1875, £129; in 1876, £179; in 1877, £229; in 1878, £385; in 1879, £515; being an average of £317. The £515 in 1879 includes £385 actually expended, and £130 carried to estimated depreciation. The sum which, set aside at 4 per cent. compound interest, will produce £22,000 for renewals of works, plant, and distributing apparatus at the end of 30 years, is £382; insured at 1 per cent. per annum, the total sum required is £395. I have left a balance of £1673; deducting additional rates to make 6s. 6d. in the pound, £160; leaving the net rateable value £1512. The rate was made in July, 1880. The money spent on repairs in 1879 sufficed to maintain the structure in a position to earn the rent, and the same amount for the last ten years has done the same. I have examined the premises, and I think certain repairs require to be done. The bad parts of the works are the retort-house and the coal-store; they were never properly constructed, and they are now in a dilapidated condition. They have existed for 30 years, and I have no doubt they have been gradually getting more and more ruinous, but the distinction between the main and the branch is not built upon piles, as they ought to have been, and they were altogether too light. It was a contractor's job, and it was a bad one. If, however, the retort-house and the coal-store were to tumble down to-morrow, it would not prevent the works being carried on and the rental being earned. For 30 years the retort-house foundation has been in a ruinous state, and in the open, having no cover whatever; but I do not recommend this. I should agree with what Mr. Penny recommended, and I should not quarrel with his estimate. All the things he has recommended would be very good, but they are not necessary for the purpose of earning the rental, the rental being earned by the works in the present state. I should myself be glad to give the amount I have estimated, £1512, for the works. I think they would let for this amount in the market. If the sum I have named for renewals had been saved from year to year, there would now be ample funds in hand to do all that is necessary, and a great deal more. If the sum named by Mr. Ryde had been appropriated, £4005 and only £1000 would be required. The sum named by Mr. Ryde would have been a fund of about £40,000. It would be preposterous to set aside such a sum, with regard to the Companies referred to as spending sums varying from 3d. to 6d. I may mention that the two Companies alluded to by Mr. Ryde—the London and the Phoenix—have avoided going to the Party of the retort-house and the coal-store. They are now well exhausted, because they did not want to put themselves under recent parliamentary obligations, and they have been spending out of revenue large sums of money on their extensions. The figures quoted by Mr. Spice included not only repairs and renewals, but actual extensions. It is not the duty of the Company to make extensions. Mr. Ryde said, "We are going to set aside a renewal-fund." My attention has been called to the case of *Reg. v. The London, Brighton, and South Coast Railway Company* (15 Q.B., 318) which shows that the Company have no right to do this. I have been a lessee of gas-works, and know it is not the custom for gas-works to set aside the meters. I have never known a case in which this has been done. The meters are vested in the incoming tenant, and they are valued again when his lease expires. I agree with the answer of Mr. Hawkey in the Lee case. He was asked, "What would any tenant taking gas-works have to pay for, independently of the meters?" And he has answered, "The value of the works." He replied, "Yes, he would, according to a well-recognized practice in making estimates of this kind." According to a well-recognized practice in making estimates of this kind, people do include a sum for the purchase of meters, but in practice it is not so. In my estimate I have given the value of all the meters, but I have not included the value of the gas depreciation, and I am certain that it is ample. If I had the works I should not use so much capital in them. I have not allowed anything for cash at the bankers. Country bankers do not require a "rest," like most London bankers. If it had been a London Company I should have made an allowance of £500.

Mr. CASTLE said he wished to withdraw his remark about the accounts being made from the figures of 1878. There had evidently been some confusion and misapprehension. He thought, however, it was hardly fair that a witness should be asked to compare his estimates in the way Mr. Castle had been asked. The chief points of difference between the witnesses with reference to the tenant's capital related to the meters and the residuals, but the most important question of all in dispute was the amount to be allowed to the tenant for repairs and renewals. Mr. Stevenson had given the actual figures taken from the Company's books, and stated that £437, including £38 for insurance, was sufficient to provide a renewal-fund, but the Company now wanted to start a renewal-fund for the first time, and said that the premises had fallen into decay, so that during the next 20 years £20,000 would be required. This was not in accordance with law. The premises had been in a state to command the rent, and the amount now required for repairs was purely a question for the Arbitrator. The Company is in a right to require the tenant to pay for repairs, upon for doing what had hitherto been done for £150 a year. If the Company had done what it was said they ought to have done, and which they were stopped from saying they had not done, they would have saved, according to the Company's figures, £1500 every year for the last 20 years, which would have produced a renewal-fund of £30,000 or £50,000—sums they could not require. Mr. Penny said all that was required was £5000, and he thus put the Company out of court. There was also another way of looking at the matter. If the works were let at a private rental, taking the gross amount, as given by Mr. Ryde, at £2449, under the Metropolitan Valuation Act, that rental would be taken and the tenant bring the net value to £1600, which was somewhat above the rental assessed by the parish. There was really no reason why gas-works should have a larger amount taken off than private works; according to Mr. Ryde, however, there was a deduction of 70 per cent. instead of 39 per cent., which showed that the whole calculation was ridiculous.

Mr. MICHAEL, in reply, said the only two material points were the amount of the tenant's capital, and the amount of the statutory deductions. As to the percentage to be allowed on the working capital of the tenant, it appeared that 174 per cent. had been allowed in Mr. Castle's original valuation, and that the same was allowed in the second valuation. Mr. Castle had apparently gone upon the supposition that the Arbitrator would add together the sums given on one side and on the other, and divide them by two, and on this account had raised his estimate £500 above that originally made. He had never given any gross estimated rental, from which anything could be deducted. Mr. Stevenson's figures in no way supported Mr. Castle's valuation. The net receipts of the Company, according to Mr. Castle, were £3583; and, according to Mr.

Stevenson, they were only £2584. The occupier's share, according to Mr. Castle, was £455; and according to Mr. Stevenson, £455. The statutory deductions, according to Mr. Castle, were £665; and according to Mr. Stevenson, £427. There was no accord whatever between the figures; indeed they were mutually destructive. According to Mr. Castle, the tenant would pay to the landlord, after all deductions, about £1940. The accounts of the Company had been put in, and it appeared that the capital consisted of 400 "A" shares, amounting to £4000, entitling to a dividend of 4 per cent., or £160, and £19,743, entitling to 10 per cent., or £1974, making together £2134. It was absurd, on the face of it, to suppose that a tenant or a company should pay in rent £1940 for the chance of earning £2140. The Company could not divide more than this profit, and it was ridiculous, therefore, to suppose that they should pay such a rent. Mr. Castle had said that in January, 1880, he applied for the accounts in order to make a valuation of the works; but he was obliged to leave his valuation on the accounts of 1878. It appeared, however, that his appointment as valuer only took place on the 21st of March, 1880, which was 26 days after the accounts of 1879 had been published. But the accounts of 1878 did not support Mr. Castle's contention any more than the accounts of 1879. He had not treated the accounts fairly. He had given 30 years as the life of the works, whereas in truth it was obvious that they had not lasted 20 years, because some portions had been re-constructed, and, according to the evidence, the whole concern was in a ruinous condition. Mr. Castle had merely allowed the money absolutely expended, and allowed nothing to be put aside from year to year. According to the judgment of Lord Coleridge in the Brighton Gaslight and Coke case, the valuer only took place on the 21st of March, 1880, to do so, but they were still entitled to the deduction. According to the evidence, the average life of the works was about 16 years, although if they had been ordinary works, built under ordinary conditions and upon ordinary materials, they might have lasted 20 years. The Company were entitled to deduct what ought to have been laid aside, although it had not been actually laid aside for purposes of renewal, taking the life of the works not at 16 but at 20 years. He was surprised to hear Mr. Stevenson say that if the works fell down the Company could still continue to work and supply gas, and that the Company would suppose that the Company could carry on its business with the retort-house and the coal-store in ruins. Mr. Stevenson had made another rash assertion—that the only thing supporting the charge of 6d. per 1000 feet for wear and tear was the fact that there were two London Companies who alone were working under the Act of 1860, and were not subject to modern statutory provisions. There were no other gas companies in London since 1860 which affected the case at all. With regard to the allocation of capital and revenue, the whole matter of legislation remained entirely unchanged. It would be found according to Mr. Field's "Analysis" that in the greatest Gas Company in the world, The Gaslight and Coke Company, the charge for wear and tear for 1879 was 5-9-3d., which strongly supported the case of the Appellants. If, however, they took it upon the amount of coal consumed, instead of upon the gas made (the production of gas being more economical in a large company), a higher charge, of over 1000 per 1000 feet, would be required. The question of meters, it was absurd to suppose that the tenant should not be allowed for them. Their life was but short, and in the course of 30 years there would not be a single meter that he would not have paid for. With regard to the sum required to renew the works, Mr. Stevenson said that £22,000, instead of £20,000, and, taking 10 years as the duration, the annual sum required would be £726 instead of £660.

This concluded the case, and it was arranged that the Arbitrator should visit the works before giving his decision.

CONTINENTAL UNION GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held at the London Offices, Drapers Gardens, E.C., on Tuesday last—HENRY McLAUCHLIN BACKLER, Esq., in the chair.

The SECRETARY (Mr. H. John) read the notice convening the meeting, and the Chairman, Mr. Backler, followed by the Directors, read the report. The printed annual report of the *Union des Gaz* Company now lying on the table will be found to contain the details of the works carried out in the various stations of that Company during the past working year. These works, amounting to £15,118, were required necessary for the constantly increasing consumption of gas in the towns where they were carried out.

A further sum of £6790 was expended on the purchase of land at Milan and at Vienna, for the future extension of the works.

The concession for lighting the town of Parma was recently renewed for 17 years, on conditions which, although not so favourable as those of the expiring contract, are nevertheless satisfactory, and will probably lead to considerable extension of business.

As all the concessions, both in the *Union des Gaz* and the Continental Union Gas Company, are, thus, with the exception of one, the renewal of which is now being negotiated, secured for long periods, that of the least important station expiring in 1897, and the most important ones from 1907 to 1924.

The excellent averages of manufacture of the past years have been maintained, and in some cases improved. The unusually cold winter of 1879-80 was severely felt in several of the towns lighted by the Company, causing the rupture or obstruction of mains and services, thereby increasing the leakage, and in some measure restricting the consumption of gas; but the results of these unavoidable accidents were more than compensated for by the increased consumption of gas during the season, and the average price of coke 8 cent. over that of the previous year. The cost of the coal distilled at the same time shows an aggregate reduction of about 11d. per ton.

As the sale of gas increased about 10 per cent. in 1879, the total gas sold was gained during the twelve months being 10,031. The amount of bad debts is still less than last year, the total being only £320 on a gross rental of £350,000.

In the Continental Union Gas Company's stations the outlay on new works has been limited to the least possible amount.

During a violent gale at Messina, one of the gasholders, at the time under repair, suffered material injury, and measures are being taken to reinstate it for effectual use as soon as possible.

The Proprietors will observe, by the accounts now produced, that the net profit have increased from £57,163 18s. 3d. to £64,416 2s., which admits of an addition of 4 per cent. to the rate of dividend. The Directors therefore declare a dividend at the rate of 7 per cent. per annum, free of income-tax; carrying forward to next year's account a balance of £6912 7s. 4d. The interim dividend of 4 per cent. paid on the 4th of July, 1880, deducted, the balance of 4 per cent. will be paid as usual on the 4th of January next.

The Directors anticipate that the interests of the Company will be largely benefited by the new legislation which will hold next year in Milan, and for which preparations on a vast scale are already being made.

Energetic means are being adopted, at all the establishments under the management of the Directors, for the improvement of the works, and the results of the past year of these efforts have proved remarkably successful. It may therefore be fairly anticipated that the business will continue to progress favourably, and that the results will prove more and more satisfactory.

The amount of the debenture debt of the Company has been reduced from £190,135 to £118,040 in the course of the financial year.

The retiring Director is Edward Garay, Esq., who, being eligible for re-election, offers himself for re-election.

The retiring Auditors are Alfred Hersey, Esq., and Frederick Tindron, Esq., who, being eligible for re-election, offer themselves accordingly.

The CHAIRMAN, in moving the adoption of the report, said he would not do so without the meeting with many remarks on the report, because, judging by the applause which greeted one paragraph in the report, it appeared to him that the sale of anything he might say was already taken out by the

tion wall of the building. Fortunately the vault was open the entire width of the building, so that a great deal of the force of the explosion was spent inwardly, otherwise the sidewalk would doubtless have been blown up, and many passers-by injured. Two gentlemen, clerks in the building, were seriously hurt, one it is feared, fatally; while the latter escaped with several bad cuts.

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following table in reference to the Water Supply of London during November. According to returns furnished to him by the Metropolitan Water Companies, 137,063,766 gallons, or 622,743 cubic metres of water (equal to about as many *tons* by measure, *tons* by weight), were supplied daily, or 263 gallons (124 decalitres), rather more than a ton by weight, to each house, and 32.2 gallons (14.6 decalitres) to each person, against 32.4 gallons during November, 1879.

COMPANIES.	Number of Houses, &c., supplied in		Aver. Daily Supply of Water in Gallons* during	
	Nov., 1879.	Nov., 1880.	Nov., 1879.	Nov., 1880.
Total supply	573,142	599,116	131,877,907	137,063,766
From Thames	274,709	287,440	67,467,984	69,535,636
„ Lea and other Sources . .	298,433	311,676	64,409,923	67,708,130
THAMES.				
Chelsea	23,945	30,420	8,104,000	8,295,000
West Middlesex	33,450	46,020	10,065,908	10,466,118
Southwark and Vauxhall . .	58,333	52,182	16,028,949	23,873,593
Grand Junction	40,285	42,937	11,318,627	11,720,225
Lambeth	62,696	65,861	13,359,500	15,000,700
LEA AND OTHER SOURCES.				
New River	129,461	132,245	26,338,000	26,666,000
East London	120,459	128,413	30,415,500	33,968,000
Kent	48,513	51,018	7,653,423	8,074,130

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for November, 1880, as compared with that for the corresponding month of 1879, shows an increase of 25,974 houses, and of 5,185,859 gallons of water supplied daily.

The following is Dr. Frankland's report of his analyses of the water supplied to London during November:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Colne Valley, 1.6; Tottenham, 1.8; Kent, 1.9; New River, 2.7; Lambeth, 4.3; Grand Junction, 4.3; Southwark, 4.7; East London, 5.0; Chelsea, 5.7; West Middlesex, 6.6. The water drawn from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies exhibited a marked improvement in quality upon that supplied during the months of August, September, and October, and it had been in all cases efficiently filtered before delivery. The water drawn from the Lea by the New River and East London Companies was also of superior quality to that supplied last month, that sent out by the New River Company being considerably better than Thames water, whilst that distributed by the East London Company was equal to average Thames water. Both waters were efficiently filtered. The deep-well water supplied by the Kent and Colne Valley Companies and by the Tottenham Local Board of Health was of its usual excellent quality for domestic purposes, and the Colne Valley Company's water was also soft, and therefore well suited for washing. Seen through a stratum two feet deep, the water presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; New River, clear and very pale yellow; Chelsea, West Middlesex, Southwark, Grand Junction, Lambeth, and East London, clear and pale yellow.

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Matter.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrates.	Total Combined Nitrogen.	Total Hardness.
Inner Circle.							
Thames—							
Chelsea	31.00	.294	.044	.003	.207	.254	1.5
West Middlesex	31.20	.290	.041	0	.283	.324	1.5
Southwark	31.82	.287	.042	0	.273	.320	1.5
Grand Junction	31.10	.190	.061	0	.239	.300	1.5
Lambeth	33.76	.210	.043	0	.286	.339	1.6
Lea—							
New River	31.04	.138	.022	0	.289	.311	1.6
East London	35.58	.243	.045	0	.328	.373	2.1
Deep well—Kent	45.90	.092	.019	.001	.508	.528	2.8
Outer Circle.							
Colne Valley	13.86	.076	.018	0	.391	.409	1.5
Tottenham Local Board .	41.14	.103	.012	.092	0	.487	2.9
Corporation of Birmingham .	25.50	.014	.023	.003	.418	.443	1.7
Corporation of Glasgow .	2.83	.131	.015	0	.006	.021	0.58

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
* Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

THE HEAT, LIGHT, AND VENTILATION EXHIBITION, which was to have been held at the Alexandra Palace from to-morrow until the 11th prox., has been postponed for a few weeks, and will, according to latest arrangements, be opened on Jan. 26, and be continued to Feb. 13.

TAR AND TAR PRODUCTS AT THE RECENT GLASGOW EXHIBITION.—A slight inaccuracy occurred when calling attention, in the JOURNAL of the 7th inst., to the statement presented to the Committee of Jurors on the secondary products of gas manufacture displayed at the late exhibition of gas apparatus, &c., at Glasgow. In the account submitted to the Philosophical Society, toluol and xylol were alluded to as substances separated from coal-tar naphtha, and which form the bases of new series of dyes and colouring matters. In the condensed account given in our pages it was made to appear as if the two substances mentioned were derived from nitro-benzole, which is not the case.

AMERICAN GASLIGHT ASSOCIATION.

(From the "Official Report" in the American Gaslight Journal.)

(Continued from p. 980.)

The paper read, after the discussion in respect to the Ross Stoking Machine, was one by Mr. G. G. RAMSELL, of Vincennes, Ind., on GAS-ENGINES.

The author said he had prepared his paper with a sincere desire that it might contain just the information needed by any gas manager to enable him, in a business-like way, to successfully advocate the merits of gas-engines, and therefore procure their extensive use; and he had devoted much time and study to secure a fair and just comparison of their merits with those of the steam-engine. He also earnestly desired to remove any prejudice, and to draw attention to the facts as they were proved by everyday experience, and not theoretically. He wished to prove that not only were small engines, of 3, 4, and 7 horse power, economical, but also engines of greater power, and in the same ratio. He then continued:

I think you will agree with me that the idea has prevailed to a large extent that, while gas-engines were used successfully abroad, their general use in this country, where the price of gas usually rules higher, was impracticable. But it is not true that where there is a difference in the price of gas, a similar difference exists in the price of other articles, and especially those that enter into the use of steam? My attention was strikingly called to this fact by the paper that Mr. F. T. Linton read before the last meeting of the North British Association of Gas Managers. By comparing his figures with those which I shall lay before you in my paper, you will see that there is just about the same difference in the expense for steam as there is in the expense for gas. There are two gas-engines in operation in our city, and I have prepared figures in each case which I hope will prove of interest to you.

The purchase of the 17-horse power gas-engine, which is of the "Otto" silent type, was somewhat in the nature of an experiment, as no gas-engine larger than 7-horse power had ever been used in this country, and as no gas-engine had been used, at least on so extensive a scale, for the same purposes—it being employed in an extensive grain elevator. For these reasons it was almost impossible to get reliable data as to the economy or adaptation of this class of engines to the work required to be performed, or any positive guarantee from the manufacturers, except that the engine should be as represented, and exert 17 indicated horse power. However, after much discussion and deliberation, it was decided to try it, and I was instructed to procure the engine.

When men seek for a motive power economy in first cost and subsequent maintenance become the principal considerations. While all who have seen the large engine in operation have admired it, two-thirds of them have been sceptical as to the result of a few gas bills; but I am happy to say to you all that both the engines in use to-day in the city of Vincennes, and the 17-horse power gas-engine, are doing gas bills more satisfactory in this as well as in every other respect. Experience has shown positively that the question of economy is no longer in doubt, but is satisfactorily known. Indeed, in the case of the 17-horse power engine, after four months constant use, running 16 hours per day for part of the time, and on the whole, the business season and the year's economy is the chief characteristic. Therefore, in enumerating the superior advantages of gas-engines over steam-engines, I would say that they are cheaper in first cost and in subsequent use, and I think I can show to your entire satisfaction that such is the case.

As to the first cost, I find that many persons consider the price, especially of the smaller sizes of these engines, excessive; but upon careful and intelligent comparison, I doubt if any fair-minded person would hesitate to say that a first-class steam-engine of equal capacity and durability, with its necessary attachments, is as expensive in first cost, while in a year's use the gas-engine is incomparably cheaper; and I think I can prove this by a case in our own city, by figures which are actual, and taken from experience with the two engines. The proprietor of the *Daily Sun*, of our city, purchased a small Baxter improved upright steam-engine and boiler, listed at 150 dollars, but for which he paid 116 dollars; and in the same month and on the same day, he purchased for repairs, he was forced to set it aside as useless. He then purchased an upright gas-engine of equal horse power, for which he paid 425 dollars, and I submit the following comparison of cost:—

I stated that his repairs in four months amounted to a little over 40 dollars; but considering this unusual and excessive, I have calculated the expense for repairs on engine and boiler at 75 dollars per year, and although the engine virtually failed in four months, I have allowed it a lifetime of good working qualities of five years, and I think those estimates are probably fair. The showing would then be about as follows:—

Steam-Engines.		Dols. c.
Engine and boiler		125 00
Repairs, 75 dols. per year, for five years		375 00
Attendance, 132 dols. per year, for five years		660 00
Coal, 14 bushel daily, 41.83 dols. per year, for five years		209 25
Kindling, 4 cents daily, 16.00 dols. per year, for five years		80 00
Oil, 12 gallons at 80 cents, 9.60 dols. for five years		48 00
Extra insurance, 15 dols., for five years		75 00

Total cost in five years 1824 45

Gas-Engine.		Dols. c.
Cost of engine		425 00
Repairs, 13 dols. per year, for five years		65 00
Gas, 22.50 dols. per year, for five years		112 50
Oil, as above, for five years		48 00

Total cost of engine in five years 660 50
Total cost of engine, five years 660 50
Less value of engine, depreciation 33½ per cent. 283 34

Net cost of gas-engine, five years 377 16

Recapitulation.		Dols. c.
Cost of steam-engine and boiler, five years		1824 45
Cost of gas-engine, five years		377 16
Balance in favour of gas-engine		1447 49
Deducting cost of engine—		
Net cost of operating steam-engine one year		339 93
Net cost of operating gas-engine one year		47 10

Balance 292 83
Cost of operating steam-engine one day 1 08
Cost of operating gas-engine one day 13

Balance 0 93

If any are sceptical, and consider my figures upon any item excessive, please observe that what was paid for a boy engineer exceeded by 532 dols. 84 c. the entire cost of the gas-engine for the five years. Besides, there is ample room for varying the figures given to suit the prices ruling

in any locality. You will also notice that I have estimated the repairs on the gas-engine at 15 dols. per year; but the fact is, the engine has been in operation daily, except Sundays, for 22 months, and not a cent has been expended for repairs. Bear in mind also that in each case the same conditions prevailed. The gas-engine was set in the same place, that the steam-engine occupied, ran the same machinery, and was operated by the same persons.

But it may be said that this is an extreme comparison—a good gas-engine with a poor steam-engine. Very good; let us see how it would show by taking a steam-engine of equal durability—calculating repairs on gas-engine one third of repairs on steam-engine and boiler, other conditions remaining unaltered. The life of each engine would now be 15 years, and the comparison be as follows:—

Steam-Engine.

Cost of engine and boiler	Dols. c.
Repairs on engine and boiler, 45 dols. per year; for 15 years	425 00
Attendance, 180 dols. per year; for 15 years	675 00
Oil, 4½ dols. per year; for 15 years	67 50
Kindling, 16-48 dols. per year; for 15 years	247 20
Extra insurance, 15 dols. per year; for 15 years	225 00
Oil, 12 gallons, at 80 cents per year; 9-90 dols.; for 15 years	144 00

Total cost of steam-engine for 15 years 5073 95

Gas-Engine.

Cost of engine	Dols. c.
Repairs, 15 dols. per year; for 15 years	425 00
Oil, as above, 9-90 dols. per year; for 15 years	144 00
Gas, 9000 cubic feet, 22-30 dols. per year; for 15 years	337 50

Total cost of gas-engine for 15 years 1131 50

Recapitulation.

Total cost of steam-engine for 15 years	Dols. c.
Total cost of gas-engine for 15 years	5073 95
Total cost of gas-engine for 15 years	1131 50

Balance in favour of gas-engine 3942 45

Deducting cost of plant—

Net cost of operating steam-engine one year 309 93

Net cost of operating gas-engine one year 47 10

Balance in favour of gas-engine 262 83

Net cost of operating steam-engine one day 99

Net cost of operating gas-engine one day 15

Balance in favour of gas-engine 84

The cost of the same power performed by hand labour was 2 dols. 50 c. per week, costing in the same time 1950 dols., or 819-50 dols. more than the entire cost of the gas-engine and expense of operating.

Now it seems to me that this one engine affords ample illustration to satisfy the most sceptical; and I wish also to lay before you a comparison of the large gas-engine, as used by the Elevator Company, and I think you will agree with me that it affords a still stronger endorsement. In this, as well as in the former case, I have endeavoured to place the figures fair, and impartial as possible, using, where it was necessary to estimate, my own judgment together with that of others whose knowledge renders their opinions trustworthy, and taking actual figures in the case of the gas-engine. In my comparison I consider the engines of equal workmanship and durability, and as filling the same place and operating the same machinery, doing the entire work of the elevator during the ten hours of each working day in the year.

Steam-Engine.

Cost of 25-horse power steam-engine (Corliss)	Dols. c.
25-horse power steam-boiler	1,230 00
Chimney, &c.	615 00
Furnace front, grates, &c.	80 00
Building for same	475 00
Engine, 60 dols. per month, 720 dols. per year; for 25 years	18,000 00
Repairs on engine, 40 dols. per year; for 25 years	1,000 00
Repairs on boiler, 75 dols. per year; for 25 years	1,875 00
Repairs on furnace, &c., 25 dols. per year; for 25 years	625 00
Replacing boiler 11 times	275 00
Erecting engine and boiler, &c.	365 00
Cost, 28 bushels daily, 8764 bushels per year, at 9 cents; for 25 years	19,710 00
Kindling, one-tenth of above	1,971 90
Water, 91 dols. per year; for 25 years	2,275 50
Oil, 40 gallons, at 80 cents per year; for 25 years	1,120 00
Extra insurance, 180 dols. per year; for 25 years	4,500 00

Total cost of steam-engine for 25 years 54,457 90

Gas-Engine.

Cost of 17-horse power gas-engine	Dols. c.
Erecting same	1,363 00
Repairs, 40 dols. per year; for 25 years	1,000 00
Oil, as before	1,120 00
Gas, 255,000 cubic feet, 511-90 dols. per year; for 25 years	12,765 00

Total cost of gas-engine for 25 years 16,465 00

Recapitulation.

Total cost of steam-engine for 25 years	Dols. c.
Total cost of gas-engine for 25 years	16,465 00

Balance in favour of gas-engine 37,992 90

Deducting cost of plant—

Net cost of operating steam-engine one year 2,093 91

Net cost of operating gas-engine one year 693 29

Balance in favour of gas-engine 1,400 71

Net cost of operating steam-engine one day 6 08

Net cost of operating gas-engine one day 1 92

Balance in favour of gas-engine 4 16

You will notice that in my comparison I have taken a 25-horse power steam-engine as against the 17-horse power gas-engine, and for this reason: Gas-engines are so constructed that they will instantly and at any time give out their full actual power, while a steam-engine depends entirely upon the boiler for its development of power, and as the generation of steam is, in practical use, more or less irregular, it follows that it would not be desirable to run a steam-engine of just the power required. Thus, in the case before us, had they not purchased the 17-horse power gas-engine, they would have bought an engine and boiler of 25-horse power. I have estimated the durability of the engines as equal, and the durability of the boiler at ten years. In my estimate of fuel I have taken the amount of bituminous coal necessary to supply the Corliss engine, probably as economical as any steam-engine in use to-day. It is also laid down by Professor Rankine in his treatise on the "Steam-Engine." As to the price of coal, I of course take the price governing it where I live, and where the engine is operated. I have made no charge for water in the case of the gas-engine, as it has required the small quantity of water it used with the gas consumed, it is charged to that account.

I feel assured that you will, upon investigating them, find that the figures are fair and just, and it would seem from them that in economy of first cost, in maintenance or expense of operating, the gas-engine has very decided advantages over steam; and as the object, I might say, is the right point in the case, it must be my excuse for dwelling thus largely upon it.

Another important economy is that of space—occupying less space than a steam-engine of equal power, while the latter requires the additional space necessary for the boiler, pumps, furnace, chimney, coal storage, &c. Where the power is located in business houses and other places where space is limited this becomes an important feature. There is a great economy in wear and tear, or durability, which is owing to superior workmanship, and the fact that all its working parts are lubricated perfectly by simple but effective automatic mechanism. In the convenience and ease with which it is managed there is absolutely no comparison. In the case of the 25-horse steam-engine, the "devil" himself could not run it, and actually gave up his job through fear of an explosion. He now starts the gas-engine, and goes to his work leaving the engine to care for itself until the presswork is accomplished, when he stops it.

Another thing I would mention is the economy of gas. Its very sensitive governor adjusts to a nicety the supply of gas to suit the load placed upon it, so that the strictest economy ensues. The maximum of gas consumed per hour per horse power of work, as guaranteed by the manufacturers, is 21½ cubic feet. In the case of the 17-horse power engine, the most it has ever consumed was while shelling corn, under a very heavy feed, while testing its power, when the consumption was at the rate of 305 cubic feet per hour, and as this was about the full power of the engine, it would show that its maximum was about 18 instead of 21½ cubic feet per hour.

You can scarcely have an adequate idea of the perfect adaptability of this motive power to grain elevators, and coming from the danger of fire or explosion, and, as shown, a great economy over steam. I have prepared from the Elevator Company's books a statement of the amount of grain handled by the engine during the four months of April, May, June, and July, and having made accurate tests of the gas consumed to perform the different classes of work, I can give you the exact figures as follows:—

18,016 bushels of corn shelled, at 0' 18 cent	Dols. c.
10,555 bushels of grain drawn up an incline from the river, at 0' 25 cent	26 38
15,577 bushels of grain fanned and dried, at 0' 22 cent	34 27
110,720 bushels of grain elevated and loaded into cars, at 0' 07 c.	77 50
154,867 bushels of grain, at a total expense of	170 60

This would be an average expense of 42-65 dols. per month—less by one-third than an engineer's wages, to say nothing of fuel, wear and tear, and danger from fire, &c. They have been able to start the engine in a few seconds day or night, and are more than satisfied with the results accomplished.

I am convinced that the gas-engine will take the place of any medium-sized engine operated by steam, perform the work more satisfactorily, and at a reduced cost. Especially is this true where the work performed is intermittent, and there are very many of the reasons why gas is the means of artificial light that apply in the same manner to the gas-engine. A very prominent one is its constant readiness for use; instead of the slow process of heating a large body of water, a turn of the wheel and the gas-engine is ready to give out its full power.

Another point of view, and one that I fail to bring to mind in favour of the steam-engine a single argument that will stand the test of accurate and impartial comparison. In grain elevators, printing offices, workshops, stores, residences, &c., their instant and constant readiness for work, and their perfect safety, which leaves insurance unaffected, render gas-engines the cheapest, most convenient, and most desirable.

Not long since two prominent architects from two of our larger cities visited our city for the purpose of investigating the merits of the gas-engine for elevators in ordinary business houses. After they had left I sat down and wrote to twelve parties who were using gas-engines for the purpose of passengers and freight elevators, inquiring as to their satisfaction, expense of running, &c. I received a reply from each one, in every case expressing complete satisfaction, and strongly recommending the engines for the purpose used—two of them mentioning the fact that in over a year's use they had not paid anything for repairs. Thinking the figures in this branch of work would be of interest, I have placed them in this paper. Of the twelve replies, nine were in such a shape that the data could be used; the other three spoke only in general terms as to expense. Therefore, I give you the results of nine gas-engines in use at the present time for passenger and freight elevators and hoists:—

Total number of engines	9
Total horse power	32
Total number of hours used per day	83
Total number of hours used per month	2,138
Total cost of gas per day	dols. 5-27
Total cost of gas per month	137-25
Average number of hours per engine per day	9-15
Average number of hours per engine per month	dols. 0-60
Average cost per hour per engine	0-385
Average cost per month per engine	15-25
Average cost per hour per horse power	9-08
Average cost per day per horse power	0-165
Average cost per month per horse power	4-29

Add to this small expense the advantages of complete safety, unaffected insurance, economy of space, entire freedom from coal dirt, ashes, kindling, &c., together with the fact that the power is in the store case all that needs to be done, and that, too, in a few minutes time each day—thereby saving an engineer's wages, and scarcely interfering with his own duties—and it does seem to me that you have the complete, cheapest, and most desirable motive power in use to-day.

The gas-engine, however new invention, and has only entered into a very few branches of industry; but there are new fields developing every day, especially in our large cities, that require just such a power as the gas-engine, and with such figures as these, taken from actual every-day experience, it will require but small effort to convince any fair-minded man, in the price of the power, or in the merits. All that is needed is knowledge on the subject, and the rapid introduction of these engines is assured. The importance of this to the gas interests of the country is very great, especially when it is taken into consideration that nine-tenths of the gas consumed would be in the daytime, when our markets are comparatively inactive.

In conclusion, I would say that those who are provided with motive power will, in all probability, retain the power they now have, although I have shown that a gas-engine would be a good investment; but those contemplating the purchase of power, especially for light and intermittent work, should be influenced by the figures I have shown that I have attempted to prepare this paper, and to embody in it such comparisons and information as can be taken and shown with convincing force to such consumers, resulting in an extensive introduction of these valuable engines.

(To be continued.)

NOTES FROM SCOTLAND.
(FROM OUR EDINBURGH CORRESPONDENT.)

In the JOURNAL for November 16, I thought it my duty to call attention to the condition of street lighting in the Metropolis of Scotland, and the state of matters was, I think, clearly shown to be anything but complimentary to the authorities who are responsible. Since those "Notes" appeared, I have not seen that any effort has been made to remedy the defects in the lamp governors, which are really past doing service, at least so far as the passage of gas is concerned; but I see that some attention has been bestowed upon the subject in another direction. I mentioned that Edinburgh could boast of possessing one flat-flame burner lamp of the Bray type, and it was really doing good work in the position in front of Haymarket, the west corner of the Post-Office, where there is an unusually heavy traffic, owing to this spot being central for the whole of the city tramway traffic. I might also have mentioned that here the traffic from the Port of Leith, from Portobello and the South, converges, and that consequently much of the time late in the night, there is continual turmoil and bustle. An effort has now been made to redeem the credit of Edinburgh in respect of street lighting, and the result is so satisfactory that I should imagine the authorities will extend their improvements to other points where a larger blaze of light at night is much required. At the Register, five or six additional Bray's lamps have been erected, and these really do much to facilitate the traffic and to show off to some advantage the architectural beauties of the Register House and the General Post-Office. This is undoubtedly a move in the right direction. The next improvement must be the overhauling of all the lamp governors attached to lamps, whether within or outside the parliamentary boundaries of the city.

The gas agitation in Montrose has subsided, but not before a sharp battle had been fought and won, as I was certain it would be, by those favourable to the adoption of the new Act. The acquisition of the works from the present Company. The majority is certainly in favour of the new efficient. The constituency—that is, those who are entitled to vote on such a question—numbers 2026, and of these only some 671 took the trouble to come forward and vote. The numbers were, for the adoption of the Act, 561, and against, 135. Although the town was well "worked," the number of electors who gave their vote was not so much, and was, pointedly small. I believe, however, that had the slightest doubt been entertained that the motion of the Provost of the town to acquire the gas-works would be in any danger of defeat, the townsfolk would have turned out in greater numbers to suppress the opposition. A *propos* of this question, I may mention that Dean of Guild, Scott, who did so much to earn for himself the reputation of a prophet, has been twitted about a desire to which he has given expression to erect a handsome ornamental gas-lamp in the Links, which are at present being improved. It is this gentleman, he it observed, who speaks so hopefully of the ascendancy of the electric light, and who has been so anxious to make a move, instead of erecting an electric lamp, to show to his townsmen its immense superiority over gas, he goes away and pays for an ornamental gas-lamp. It is strongly suggestive of the story told of the ecclesiastic who predicted that in the world within a few months, and who, nevertheless, took a lease for five or ten years of the house in which he was living. It may be that the Dean of Guild is erecting the lamp from a desire to kill two birds with one stone, and from a desire to utilize the works as much as possible after they have been acquired; but no matter how this may be, the gentleman has meanwhile done a proper and highly commendable thing in erecting the lamp.

The Hawick Gaslight Company met on Monday last, and then had under consideration the desirability of removing their works from their present site. Owing to the successful manner in which Mr. Smith has managed the works during the past few years, the Directors feel warranted in coming to the conclusion that it would be well to make a move. At present the works are at a considerable distance from the station of the North British Railway Company, and consequently the cartages to and from the works form serious items in the accounts of the Company. It is calculated that the loss resulting from removal alone will amount to £500, but it is anticipated that in the course of a year or two it will be saved on cartages, by removing the works to a point contiguous to the railway station. The Company at their meeting unanimously resolved to forego a portion of the Wilton Glebe, and upon the ground so acquired it is proposed to begin to erect the necessary new works. Another reason which induced the Company to consider this move, and their present works are by far too small for the rapidly increasing business.

Within the past few months there have been many changes in the management of gas-works in Scotland, but few of the readers of the JOURNAL will be prepared for the announcement that Mr. Robert Mitchell, lately of Coatbridge, and now of the Dawsholm works belonging to the Glasgow Corporation, has been appointed Engineer and Superintendent of the Edinburgh Gas-Works. When I state that few will be prepared for such an announcement, I mean that his transference from Coatbridge to the neighbourhood of Maryhill was so recent, that further changes, in the meantime at any rate, could hardly be expected. But the duties at Dawsholm, I understand, were not altogether suited to Mr. Mitchell, and accordingly, when it was announced that Mr. Barclay Henderson had, after a life of devotion to his duties, retired from the practical superintendence of the works in Edinburgh, Mr. Mitchell made application for the post. The Board at that time included several gentlemen south of the Tweed; but the Directors, after inquiry, have selected Mr. Mitchell as their Engineer and Superintendent.

The movement for the formation of water supply districts in the rural parishes of Scotland seems to be gathering strength, and to be spreading to the most remote of the country to the other. At a meeting of the Bathgate Parochial Board, acting as the Local Authority, it was resolved to form the village of Bridgend into a special water supply district. The Linlithgow Police Commissioners have been debating the subject of improving the existing water supply of the town. A majority have resolved that certain improvements are strongly objected to on the ground that they are but the commencement of a new water scheme. At a meeting of the Galashiels Town Council on Monday it was stated that the actual cost of the water-works was £50,000, or £150,000 more than the estimate price, and that it would be necessary to borrow £10,000. A statement of the amount expended in connection with these works, and an estimate of the probable sum yet required, are to be prepared, and will be submitted to a special meeting. The Dunfermline Town Council have agreed to grant a supply of water to the North Queensferry supply district. The Aberdeen Town Council have, I believe, resolved to grant a supply of water to the village of Torry, on the opposite side of the river from the city, under certain conditions respecting the road.

The Kirkcaldy Town Council, and such members of it as are resolved on prosecuting the scheme for bringing a larger supply of water into the town, as well as into the town of Dysart, are likely to have a hot time of it. An opposition has arisen, the champion of which seems to be a Mr. Westwater. This gentleman lives in the very heart of the town, and is an Ultra-Radical of the most pronounced type, if one is to judge by his

utterances. He characterises the scheme, which, by the way, is to afford a more plentiful supply of water for the manufactories that abound in the town, as "the foulest tyranny ever inflicted on a free people," and he said he would rather throw away the money which had already been spent than that they should lose their liberties. He would, he said, resort to any means to defeat the measure. Despite, or perhaps rather because of this bombastic nonsense, the Commissioners have carried their point so far.

I recently mentioned that the Sheriff Substitute of Perth had ordered the Local Authority to form the village of Stanley into a water supply district. The objectors to the scheme brought this decision under the review of the Sheriff Principal, and he has now decided to remit to Mr. Thomas Stevenson, C.E., to inquire and report as to the tendency of the district to increase or otherwise; the quantity of the water supply and its quality; and whether a sufficient supply can be obtained from present sources.

Great dissatisfaction has prevailed for some time as to the water supply of the village of Bora—a supply which is taken from the river of that name, and which is said to be impregnated with all sorts of filth—and, as the Local Authority refused to move in the matter, the Sheriff was appealed to. He has defined a water supply district, and in doing so condemns in strong language the nature of the pollutions complained of.

(FROM OUR GLASGOW CORRESPONDENT.)

The most prominent fact this week in connection with gas matters, coming within my province, is the resignation by Mr. Mitchell of the appointment which he received about two months ago from the Glasgow Corporation Gas Commissioners, to serve as Manager at the Dawsholm Gas-Works. The resignation of his office, which he held for some time, was just been appointed by the Edinburgh Gaslight Company to the position of Engineer and Superintendent of their works, both indoors and out-of-doors—a position which is well-nigh the "top of the tree" in the gas engineering profession in Scotland. Rarely has it fallen to the lot of so young a man to attain such a high position in gas matters. Mr. Mitchell is already receiving the hearty congratulations of professional brethren. Mr. Mitchell will not leave Glasgow till about the beginning of February, and in the meantime the Corporation Gas Committee will proceed again to make a new selection for the Dawsholm station. It is not unlikely, I understand, that they will limit their choice to the small lot from which Mr. Mitchell was eventually chosen.

At the last monthly meeting of the Town Council of Rothsay, the Gas Committee reported that they had made the usual inspection of the gas-works, which were found to be in good order. The report also stated that the quantity of gas manufactured during the month of November was 2,330,000 cubic feet, being an increase of 292,200 feet as compared with the corresponding month of last year.

The Police Commissioners of Ayr, at their ordinary meeting held last Monday, had under consideration the securing of suitable premises for carrying out gas testing and repairing, and at the same time, they were to take steps to ascertain the price of the necessary apparatus. A report was submitted from Mr. Robb, Manager of the gas-works, stating that the illuminating power of the gas supplied by the Gas Company during the month of November had been 292-2 candles, and that, as usual, it had not only night fallen below the 24 candles. In the course of a conversation which followed, it was stated that as the Company was a private one the Commissioners could not interfere in regard to the quality of the gas supplied.

A meeting of the principal feuers in the village of Kilmalcolm, a kind of residential suburb for which to do people carrying on business in Glasgow, Glasgow Paisley & Co. held an annual meeting last night, to consider the question of public lighting. Hitherto it has been carried on by a fund raised by voluntary subscription, but as many of the people who were getting the benefit of the lighting did not contribute to the fund, the lighting has not been so good as it might be. The meeting was held in the evening, and at the meeting it is very probable that an attempt will be made to form the place into a burgh, under Lindsay's Scotch Police Act of 1862, and so make the assessment for public lighting compulsory, if the ratepayers do not now agree to the imposition of a uniform voluntary lighting rate. There is not any objection to the Company's plan of public lighting in hand, as a large proportion of the Shareholders are non-resident.

The subject of adopting the Burghs Gas Supply (Scotland) Act was under consideration at a meeting of the Town Council of Crieff held last Monday night. Mr. Cochrane said that he had brought up the question about three weeks ago, and that he hoped to get the necessary sanction, and with the view of this he proposed that a Committee be appointed to communicate with towns similar to Crieff, to get up information on the subject and report to the Council. Some conversation took place on the question raised by Mr. Cochrane, one of the speakers being the Provost, who said he did not know a town worse off for gas than Crieff. He burned paraffin oil, and there others to do likewise they would make the Gas Company do better. Eventually a Committee was formed for the purpose, with Mr. Cochrane as Convener.

The Falkirk Lighting Company have resolved to reduce the price of gas from 4s. 7d. to 4s. per 1000 cubic feet, the reduction being effected by the last meter survey. It may be remembered that when this Company took over the works, now a little over two years ago, the price of gas was 5s. 10d. per 1000 feet, so that altogether a reduction of 1s. 10d. has been made. From calculations which have just been made it is considered that the gas consumers of Falkirk will be paying, with the present reduced price of fuel, less than they were doing before.

In last week's "Notes" I referred to the rapid increase in the consumption of gas for cooking and heating purposes in the town of Dumfries, and now I have to mention that there is also in progress an extension of electric lighting for industrial purposes. A well-known firm, who have long been in the town, have for some time had the electric light in use in their engine shop, and at present they are fitting up the necessary arrangements, and getting new dynamo-electric machines placed for the purpose of extending the light into their new and extensive boiler-shed. By-and-by they will doubtless be able to say what I have said in previous columns, that the adoption of the electric light in their extensive works.

It is stated that the town of Kelso was one of the first places in Scotland to introduce the system of lighting by gas, and, acting on the belief that it is as well adapted as ever to become a pioneer in progress, there are some people who think that it ought to be the first provincial towns in Scotland to be lighted by electricity. The Police Commissioners are urged to think over the matter seriously, and to open communication at once with Mr. Swan, of Newcastle, with the view of arranging with him to light the streets of the town by this system. It is said, makes it very difficult to elect a much more economical than the methods previously in use. Persons who talk in this way either do not know or ignore the fact that the Burgh Police Commissioners in Scotland have no power to use burgh rates for public lighting in the way suggested, even though it were proved that electric lighting was so economical and efficient as lighting by gas.

During the week the pig iron warrant market has been firmer, and a fair

business has been done at better prices. This firmness arises chiefly through the hopeful anticipations of what the opening year will do. The makers are readily meeting this demand, and iron is being rapidly pushed into store in order to meet it. The closing prices were—buyers, 51s. 6d. cash, and 51s. 9d. one month, and sellers 1d. more, the gain over the week being 3d. per ton.

There is an average demand in the coal market, more rogado being shown for house descriptions. Prices remain unchanged.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

A quiet tone still prevails throughout the coal trade of this district, with, if anything, a want of firmness in prices, sellers in the large colliery districts of West Lancashire being unable to maintain the full extent of the advance attempted at the commencement of the month. For the better classes of round coal there is only a moderate demand as compared with the pressure for supplies which existed last month, and at many of the collieries there have not been sufficient orders coming in to keep them going all through the week. For best Wigan Ayr the average price obtained at the pit's mouth is not more than 48s. 3d. per ton, whilst inferior qualities are offered at from 5s. 6d. to 7s. 6d., and good Farnworth four-feet at 7s. to 7s. 6d. per ton. In common classes of round coal the demand for ironmaking purposes continues only limited, and the really obtainable advance has been very small; good qualities of steam and forge coals being still offered at the pits at from 5s. 3d. to 5s. 6d. per ton, and there is some pushing for orders in the market. In engine classes of fuel trade is tolerably steady. The mills throughout Lancashire are now tolerably well employed, and their requirements for slack are to a considerable extent counterbalancing the increased production of this description of fuel; good qualities at the pit's mouth still fetching from 3s. to 3s. 6d. per ton, and common sorts 2s. 6d. to 3s. per ton. Burgy, which meets with only a limited inquiry, is quoted at about 4s. to 4s. 6d. per ton at the pit.

For local-made cokes there is still a tolerably fair demand for iron-making purposes at about late rates, and I have been told of some very large transactions in north country cokes for next year, which would seem to indicate the anticipation of a considerable amount of activity in this description of fuel.

The iron trade has been only quiet, and any business offering is chiefly for delivery over the next quarter of next year. Where sellers are inclined to contract up to the end of June at present rates, orders are to be made, but local makers of pig iron decline to go beyond the end of March, for which period they are firm at 46s. 6d. to 47s. 6d. per ton, less 2½ per cent. for delivery equal to Manchester. Finished iron makers report trade very quiet, and in some of the special sections are only now coming in for iron sold during the period of high prices at the commencement of the year. Foundries especially are very dull, and pipes and other descriptions of castings are quoted at very low figures. For bars delivered into the Manchester district the average price remains about 45 15s. per ton.

The agitation for an advance of miners wages outside the Manchester district has so far been unsuccessful, and until there is a more substantial improvement in trade it is scarcely probable colliery proprietors will be willing to pay any higher rate of wages.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The tone of the markets generally in the coal trade of this district remains unchanged. Though there is still considerable room for improvement, masters agree in their expression of a better existing demand. In particular may be noted the pits of the Cannock Chase district, wherein the hands are perhaps doing more regular and longer turns than have been known for a long time past. Here orders are pretty plentiful, both for deep and shallow coals. In other parts of the district fuel for manufacturing purposes is being raised plentifully, and the stocks at the pit's mouth are being rather reduced than otherwise. Gas coals are not so much looked for; rates, however, are firm.

The iron trade is steady, and transactions are fairly numerous both in regard to raw and finished material. The near approach of the quarter's end is causing buyers of large parcels to withhold orders. It is generally considered improbable that any alteration will be made in the existing rates of best makers. List houses, however, are firm, and there are plenty of inquiries for forward delivery. The demand for unbranched bars is sustained, as also it is for sheets and hoop iron. For several classes of manufactured iron there is notably a weaker market, owing in particular to the near approach of the holidays. Smelters are turning out a slightly increased quantity of pig, which fact is also attributable to the nearness of the Christmas holidays. The iron works have expressed themselves strongly on the subject of the recently regulated sliding scale, and have resolved to terminate forthwith. The Wages Board are now considering what movement will be most advisable in the matter. Sheet iron manufacturers are busy, and orders for export are more numerous. Prices of finished iron at the recent markets were unaltered, best marked bars being firm at 47 10s.; unbranched bars, 46 to 46 10s.; and strip and hoop realizing 46 5s. to 46 10s. Pig iron was slightly a better sale, and inquiries were numerous. Ironstone sold well, as also did other minerals.

YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The iron trade in both the South and West Yorkshire districts has undergone no alteration since last week, either in value or demand. The make of pig iron is fully an average, one of the furnaces being kept in full work. In finished iron neither district presents much alteration. The foundries are by no means well off for orders, except where goods of special note, such as gas and water apparatus, are produced. A very large tonnage of ironstone is being imported from North Lincolnshire, in which district trade continues lively. Most of the works devoted to the production of Bessemer steel rails, axles, &c., are well off for work.

The coal trade, taken as a whole, was, up to the middle of last week, in a moderate state. The mild weather has of late greatly influenced the sales, but with the return of keen frosts the trade is improving. In the Metley part of the West Riding district there has been a falling-off during the week, some of the pits only making four days per week. In the southern part of the coal-field, business up to a few days ago was sluggish, but an improvement seems now to have set in. The London and Leeds trade during last and most of the present month has been pretty good. Both the Midland and Great Northern, as well as the London and North-Western Railways, have sent a very fair tonnage. The Silkstone and thick-seam pits have forwarded increased supplies. From both South and West Yorkshire a large quantity of steam coals are being sent to Hull. Out of 95 collieries which send coal to this port, 24 in Yorkshire last month contributed no less than 81,227 tons, more than half of which went from West Yorkshire. Grimby is taking fully an average tonnage from South Yorkshire, and Goole from the West Yorkshire pits. The contracts for gas coal, which were entered into earlier in the year, are just now in full operation, so that collieries which are raising a good gas coal are working very well. The largest tonnage from South Yorkshire appears to be going to the Midland Counties. The sale of slack and small coal for manufacturing purposes is not over good, and as the coke trade is slacker, the market for anthracite is rather lower. The output of coke is pretty well sustained, but at the North Gawber Hall Colliery there are rather formidable stocks on hand.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The gas coal trade of the county of Durham kept very busy over the whole of last week, notwithstanding the detention in the early part of it of steamers in their passage from the south.

The collieries are full of business until the end of the year, and the principal pits in the trade cannot give a loading turn until the first week in January. The shipping trade was very active up the Tyne Dock in the last few days of last week, and the shipments were very little short of those of the previous week. Most best qualities of north country coals have improved in value in December, though where the advance has been made it has been very slight. This improvement has lasted in the sale of manufacturing, small, and coking coals for the local iron and chemical works. Contracts continue to be entered upon for the supply of coke over the next half year in the iron-works, at slightly higher prices. The prospects of the steam coal trade for next year are tolerably satisfactory.

The supply of steam coals for the manufacturing purposes is fair, number of boats are on offer. Rates to London are 4s. 1½d. per ton, which is 4½d. down. Small sailing vessels are very scarce; in fact, they are not to be had. It is every day becoming more apparent that some other arrangements will have to be made in the future for the conveyance of coal to the bye-ports than by ordinary sailing vessels. The scarcity of little craft of six keels and upwards stands very much in the way of the shipment of small parcels of fire-bricks, pipes, and this class of material.

As is usual within a week of Christmas, there is a pause in the general manufacturing business. Nothing is being transacted for next year. Speculation seems to be quite out of the market. The chemical trade gives some indications of improvement, and soda, bleaching powder, and ash bring somewhat better prices. The fire-brick trade is extremely quiet. There are some inquiries for next year's delivery, but they have not led to any great amount of business, and there are but a few transactions in cement, or material of that description, and the finished iron and foundry business is doing best in the larger sorts of work for the iron shipping yards and the marine engine factories. They are very well employed on the Tyne. There is no special demand for timber of any description. A quiet last-to-mouth trade is being transacted, and no more. The lead trade is flat.

SALES OF GAS AND WATER SHARES.—On Tuesday, the 14th inst., Mr. B. Powell offered for sale at Aylsham eleven £10 shares in the Aylsham Gas Company, which realized prices ranging from £14 to £15.—At Faversham, on Wednesday last, Mr. H. Minier offered for sale by auction the following gas and water shares, which realized the prices stated.—19 fully paid-up £10 shares in the Folkestone Water Company, £19 and £19 5s. per share; 5 fully paid-up original £10 shares in the Faversham Water Company, £17 per share; 5 fully paid-up preference £10 shares in the same Company, £19 per share; and 8 ordinary £10 shares, £5 paid up, in the same Company, £12 5s. per share; 14 fully paid-up £10 shares in the Dover Gas Company, £15, £15 5s., £15 10s., and £15 15s. per share.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Dec. 15, 1880.

Company.	District.	Illuminating Power.			Sulphur.			Ammonia.			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company.	Notting Hill	17.5	17.0	17.3	10.0	8.6	9.4	0.3	0.0	0.1	None.	In excess.
	Hamden Town	17.7	18.4	17.9	17.8	14.6	16.5	0.7	0.0	0.0	"	"
	Dalston	17.5	17.6	17.7	16.9	9.7	19.0	0.3	0.0	0.1	"	"
	Bow	17.5	16.7	17.1	14.6	11.9	13.8	0.4	0.2	0.3	"	"
	Chelsea	16.8	16.1	16.6	16.5	13.9	15.0	0.6	0.0	0.2	"	"
	Kingsland Road	17.3	16.7	17.2	14.8	12.1	13.4	0.2	0.1	0.1	"	"
South Metropolitan Gas Company.	Westminster (cannel gas).	21.4	20.6	21.0	20.3	15.0	17.1	0.0	0.0	0.0	"	"
	Peckham	16.4	16.4	16.4	16.1	8.9	10.5	0.2	0.0	0.0	"	"
Commercial Gas Company	Old Ford	17.6	17.1	17.3	15.9	12.9	13.9	0.6	0.2	0.3	"	"
	St. George-in-the-East	17.9	17.0	17.6	12.0	10.6	11.0	0.2	0.0	0.0	"	"

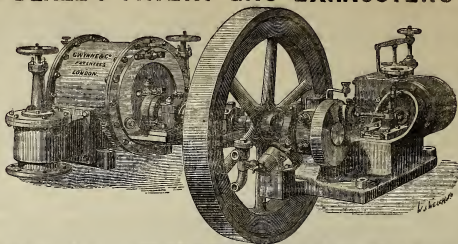
(Signed)

T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 30 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



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Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

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GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

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Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

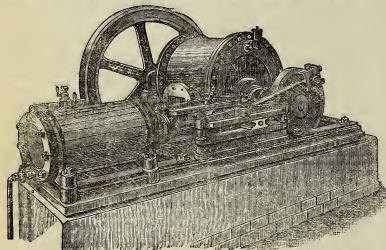
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MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[SEE ALSO ADVERTISEMENT, PAGE 990.]

Phoenix Engineering Works:

HOLLAND STREET, SOUTH WARK, S.E.

WANTED, Readers of a Pamphlet, prepared for Gas Companies to distribute, to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c. Copier, by post, Threepence, direct from the Author, **MAGNUS OBERG, Assoc. M.I.C.E., Gas-Works, SYDENHAM.**

WANTED—The Advertiser, a Young Man, aged 30, married, in open for an Engagement as **MANAGER** and **SECRETARY** of a medium-sized Gas Works, or **SUB-MANAGER** of a large Works. Has a thorough Knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Gas-Works for 16 years. Highest testimonials and references. Address No. 678, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Newcastle-under-Lyme Gas Company, a good, efficient, and steady **GAS-FITTER**. General good character indispensable. Applications and references to be sent to the undersigned. W. WINTHAWLEY, Engineer and Manager.

TO GAS MANAGERS.]

WANTED immediately, by the Town Commissioners of Newry, a competent **MANAGER** for their Gas-Works, at a salary of £150 per annum, with residence, coal, and gas. Applications, with copies of testimonials, to be addressed to the Chairman of the Gas Committee. JOHN KENNEDY, Secretary. Newry, Dec. 17, 1880.

WANTED, a Second-hand Beale's EXHAUSTER equal to about 10,000 or 12,000 ft. per hour. Address FRIDR. S. HENFLEMAN, Manure Works, West Ham, London, E.

THE Town Commissioners of Bandon will receive APPLICATIONS from persons competent to discharge the duties of **MANAGER** and **FITTER** of their Gas-Works. Salary at the rate of £100 per annum, with residence, coal, and light. Applications, accompanied with reference and testimonials, to be lodged with me, on or before Saturday, Jan. 1, 1881. S. R. TREFILLAN, Clerk to the Commissioners. Bandon, Dec. 9, 1880.

TO GAS ENGINEERS AND MANAGERS.

WANTED, by the Georgetown (British Guiana) Gas Company, Limited, an **ENGINEER** and **MANAGER** for their Gas-Works, at Georgetown, Demerara.

Salary £200 per annum, with a bonus of £50 for every 1 per cent. per annum paid in dividend over 5 per cent. per annum on the ordinary share capital. The Company are at present paying 5 per cent. per annum on the preference, and 7 per cent. per annum on the ordinary shares; £75 per annum will be allowed for house rent; coke and gas free; the Company also provides a horse and carriage; passage out and home paid for, half salary allowed during passage out, home, and full salary on arrival.

An agreement must be entered into for a period of five years, terminable, at the option of the Company, at the expiration of the first or third year. Form of agreement to be sent at the Office.

Security required to the extent of £500. The selected candidate must be prepared to leave England not later than the 31st of March next, but will not take charge as Manager until July 23 next.

Applications with testimonials (copies only) to be forwarded to the Secretary of the above Company, 30, Gracechurch Street, London, on or before Jan. 31, 1881.

By order,

ALFRED LASS, Secretary.

Offices, 30, Gracechurch Street, London, Dec. 17, 1880.

GAS-METER MAKING AND REPAIRING.

FOR SALE, as a going concern, capital PLANT, in good working order. In-coming about £150.

For particulars address U 334, Mercury Office, LEEDS.

GAS PLANT FOR SALE.

THE Buxton Local Board have for Sale One EXHAUSTER, Engine, Bye-pass, &c., complete, with 5-in. Connections, for 10,000 per hour, two 8-in. Bradstock's Compensating Governors, with bye-pass to serve for one or both, and one circular-cased Station-Meter, by Newton, of Oldham, 60 ft. per revolution, bye-pass, &c., complete. For price and particulars apply to Mr. Geo. Smedley, Gas Office, Buxton. JONIAN TAYLOR, Clerk to the Board.

AMMONIA PLANT FOR SALE.

A COMPLETE Plant in thorough working order, to make up to 1½ tons daily; or Saturator and Crystallising Pans will be sold separately. Also Cornish and other Boilers, Tar Sells, Hydraulic Press, Iron Tanks, Tangy's Pumps, &c., for Sale, and Wastside Premises to be Let.

Apply to T. V. CLARKE, on the premises, Trundley Lane, Surrey Canal, DRYTHERD, S.E.

Mr. Clarke will contract for the Re-erection of the Tar and Ammonia Plant in any part of the country.

THE Gravesend and Milton Gas Company have FOR SALE, Four 12 ft. square PURIFIERS, 4 ft. deep, with 12-in. Connections and eighteen 12-in. Donkin's VALVES, together with Lifting Apparatus, all in fair condition, and can be taken possession of immediately; also one 8-in. GOVERNOR, by Sugg, of Westminster.

For further particulars apply to the undersigned. S. SOWDON, Manager.

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TO CORRESPONDENTS.

G. B. L.—Directly we obtain the necessary particulars, an account of the two gas-engines you mention shall be published.
W. W.—As your letter may lead to some correspondence, we have held it over till next week, so that the whole of the references to the matter may appear in one column. If your notes are not divided, as they would be if the subject were referred to this week.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 28, 1880.

Circular to Gas Companies.

NOTHING illustrates more clearly the difference between ancient or mediæval and modern political economy, than the alteration in the standards by which corporate wealth is estimated. In former times a town or country was considered to be rich in proportion to the amount of positive wealth in gold, or other realizable effects, actually in its treasury, and awaiting a possible conqueror. In modern days, so far from a rich community having any disposable cash in its public coffers, it is generally remarkable for being positively in debt to an amount quite beyond its power to repay at short notice. In fact, a common measure of the wealth of a modern community, national or municipal, is its power to borrow money at low rates of interest. Yet it is beyond dispute that the Government of this country, with its liability to pay annually nearly 29 millions sterling as the cost of a debt of over 782 millions, which it is otherwise quite unable to discharge, represents a nation richer than any the world has yet seen. The fashion of chronic indebtedness thus set by the general Government is faithfully followed by our Municipalities, who, even if they possess much property, always owe a great deal more than they can pay; in other words, their riches are represented by their liabilities. Of course, this state of things is due to the modern growth known as credit—an influence that has revolutionized the social state of civilized man only within the past 300 years. Public credit is a wonderful thing, only surpassed in its power by its delicacy, and this extreme sensitiveness appears to increase with its growth. We are all interested in its maintenance in a duly healthy condition, yet not even those who claim to be most conversant with its moods can foresee its state from one week to

another. Consequently, those who are about to test its condition in a practically crucial manner, may be excused for manifesting much anxiety, and even trepidation, as to the result of their venture.

The Corporation of Birmingham are just at this critical point. They have determined to try the temper of the Money Market by issuing, through the Bank of England, corporation stock to the amount of two millions sterling, to form the initial subscription for a corporation loan. The Municipality of the Midland capital owe on mortgage various amounts borrowed from time to time, including £1,130,000 advanced by the Public Works Loan Commissioners, and they wish to be enabled, by the fresh issue of stock of a uniform class, to clear off these outstanding liabilities, and to raise certain sums that will be immediately required. The Bank of England authorities have consented to issue the new stock on certain terms which, although rather high, the Finance Committee were disposed to accept, in view of the advantages to be gained by issuing the stock by such an agency. The stock is not to be thrown upon the market hap-hazard; it will be issued at a minimum price of 98, and be made redeemable in 60 years. Judging from the experience of the Liverpool Corporation, whose 3½ per cent. stock now stands at 102, the Birmingham stock might at least be expected to be taken at par, when it would result in an economy of between £1500 and £1600 per annum to the town, as compared with their existing methods of borrowing. If a premium of £1 can be secured, to be paid to the credit of the sinking-fund, the town will realize £2500 instead of £1600 per annum by way of profit on the transaction. By issuing the stock at 98 instead of at par, the Corporation appear to indicate that they are in earnest in their desire to float their loan even at a small sacrifice; which, however, we do not believe they will be called upon to make. They are distinctly right in retaining the amount of control over the debt implicated in their retention of the right of redemption at a stated time, in spite of the fact that the stock is thereby made slightly dearer to them. But, as we have already remarked, there is no reason to suppose that, with such splendid security as they have to offer, the Corporation will have cause to be other than satisfied with the result of their venture.

It must not be forgotten that the intended issue is quite experimental in character. The Corporation are in no way bound to submit to the verdict of the London Stock Exchange, should it prove unfavourable to their scheme. It is not in them to command success. By the time the subscription is actually opened—which will probably be about the middle of January next—causes yet unsuspected may operate to the prejudice of all classes of investments, for the fluctuations in the value of stocks and shares are even less susceptible of prevision than the weather; but against the worst effects of such disturbances the Corporation are already protected. They can always get money from the Public Works Loan Commissioners, as they have done before, although such a failure as the necessity of reverting to this procedure would mean, would be sincerely regretted beyond the limits of the borough. As a matter of broad principle, large and important towns like Birmingham should be able to stand alone, and raise such funds as they may require without the aid of the Central Authority. There is no reason why Government credit should be drawn upon when the improvement of streets, or the extension of gas and water-works, is required in a locality boasting as large a population as many an independent nationality can muster. It is conceivably safer and better for small towns to draw money for capital purposes under the control and by the machinery of the State; but it is as unfair to tax the pre-occupied Executive with the affairs of communities well able to provide for themselves, as it is to require the latter to conform in all cases to regulations that are justly applicable to less robust organizations.

As to the manner of placing the proposed loan, we agree with the Finance Committee, as against the more effusively philanthropic members of the Council who wish to see a more distinctive local element imported into it from the beginning. It is most desirable to afford means whereby the savings of provident townspeople may be readily invested in the loans of their own local government. The advantages of such a practice, if it can be established, need not be further enlarged upon here; but it must be properly managed with strict regard to all the circumstances of the case. First of all, it is the obvious duty of those having the responsibility of issuing a corporate loan, to do so in the way best calculated to obtain the highest quotation for it. When this is done, in the interests alike of the town and of its thrifty inhabitants, arrangements may subsequently be made whereby dealings in the

loan, or in the future subscriptions to it, shall be facilitated in any of the ways known to benevolent financiers. This is the right course to pursue, and if the Finance Committee do not eventually lose sight of their promise to institute means to enable a workman to purchase corporation stock as easily as he can open an account with Her Majesty through the Post-Office Savings Bank, none will have cause to regret that they have considered it necessary to avail themselves of the assistance of the Bank of England in the first subscription to their new municipal loan.

The Bill to be promoted in the ensuing session by the South Metropolitan Company is brief but pregnant. The Company desire to raise one million pounds of additional "C" capital, to be classed with the capital under the same heading in the scheme for the amalgamation of the South Metropolitan and Phoenix Companies, sanctioned by an Order in Council on the 18th of March last. By the provisions of this scheme, the "C" capital partakes with the other classes up to eleven per cent. dividend, beyond which it will receive one-half of any increased dividend, the other half going to the "A" shares. The new capital will, of course, be sold by auction or tender, as provided by the Company's Act of 1876. Power to borrow on mortgage a sum equal to one-fourth part of the paid-up capital for the time being is included in the Bill. The Company seek to acquire about 140 acres of land on the river side at Blackwall Point, in the parish of Greenwich, for the purpose of constructing a new manufacturing station thereon, and also for manufacturing and converting the residual products of their own or any other Company's works. The Company also desire power to supply gas in bulk beyond their own limits, and to break up roads and streets and lay pipes in such outside districts.

There is some danger that the Lincoln Bill, authorizing the acquisition by the Corporation of the undertaking of the Gas Company, will have to be dropped. The statutory town's meeting for the consideration of the Bill has been held, and it was then rejected by an overwhelming majority. The meeting was said to have been largely composed of non-ratepayers, and was extremely noisy, especially after the delivery of several inflammatory speeches by opponents of the transfer. As usual in such cases, the advantages to be derived by the Gas Company were much magnified by these orators, who did their best to excite the indignation of the groundlings by the recital of the large sums that were to be taken out of the rates to compensate the Directors, and in other ways helped to show how well qualified a public meeting is to deal with questions of finance. After the show of hands had been taken, a poll was demanded, and it will, consequently, be seen whether the majority of the ratepayers are content to be led by their own representatives or by the blatant speakers against the Bill at the meeting. Meanwhile the Council have decided to seal the petition for the Bill, and the matter will, therefore, go on for the present—at least until the popular vote has been declared. Unfortunately for the Council, they are in the interim acting at their own risk, for a refusal of the ratepayers to sanction their past or present proceedings will be attended with many unpleasant results. For their sakes it may be hoped that the recent meeting was in reality the insignificant affair it was described as being by the Mayor, who it is needless to say is an advocate of the proposed transaction, but is equally anxious to act only in accordance with the real wishes of the people.

The Swansea Gaslight Company have quite recently attempted to satisfy the Town Council in the matter of the public lighting, by consenting to reduce the price charged for the street-lamps to the Local Authority from £3 ls. 8d. to £2 15s. per lamp per annum, giving 92 hours extra lighting without charge, and also substituting $4\frac{1}{2}$ cubic feet for the former 4 cubic feet per hour burners. To any reasonable being it would appear that these concessions are not only liberal in themselves, but even more strikingly testify to the desire of the Directors of the Company to conciliate the Council. Far different is the manner in which the latter body regard the action of the Company. They consider the reduction in the price of gas to the public lamps, and also the remission of threepence per thousand feet to private consumers, which is to take effect from the beginning of the New Year, as totally inadequate to meet the just requirements of the public. The Local Authority want to have the gas undertaking in their own hands, and therefore, aided and abetted by a section of the local Press, they take every opportunity of disparaging the gas and vilifying the present management; and the ratepayers are stirred up by the publi-

cation of parallels drawn from Metropolitan and other sources to show that Swansea gas at 3s. 3d. per thousand cubic feet is excessively high-priced. We are used to this style of argument from provincial orators, who, when agitating for a reduction in the price of gas at Great Winklebury, or some other equally important market town, never fail to inform their hearers that gas is sold at Leeds or Sheffield, or other strictly comparable place, at about half the price paid for their own supply. Of course it would be a pleasure to the Swansea Town Council to see the Gas Company selling gas at a price that would render dividends impossible; but if the undertaking becomes public property, how much will the price be at once reduced? As to the management of the gas supply, the public are perhaps better served by the Company than they would be by the Council, unless the latter change their system of doing business. The management of the property at present belonging to the Council, as representing the town, is not so brilliantly successful that the gas consumers could regard without some trepidation a transfer of their interests to such hands. However, the inevitable course will probably be pursued here as elsewhere—all kinds of complaints against, and popular discontent with the gas supply will be fostered by the Council until they take charge of the business, out of pure charity, and only to save its life; whereupon clamour must cease, and every ratepayer must be satisfied with the treatment he will receive. Gas Companies *always* mismanage their property; Gas Committees never do.

Warrington offers a good illustration of the necessity for Corporation gas management to extend the consumption of gas by all possible means. Although the Corporation have not fallen into the error of allotting any proportion of the gas profits to aid the rates, or for any other purpose of a similar nature, the price of their 18-36-candle gas is 3s. 6d. per thousand cubic feet, which appears to many members of the Council to be unnecessarily high. The Gas Committee are, of course, anxious to produce gas as cheaply as possible, but in addition to their inherited capital charges, they are engaged in constructing entirely new works, the whole cost of which is as yet unproductive. When the new station is completed, the Committee will be able to manufacture gas there at a lower cost than is possible at their old works, and it will then become essential to make a slight reduction in price, and to use every endeavour to increase the consumption of their gas, in order that the enlarged capital liabilities of the undertaking may be satisfactorily met, and at the same time the gas rendered so cheap that the great advantages of the gas supply being under Corporation control may be more apparent to the local public than it is at present. The Gas Committee must be credited with the desire to make themselves acquainted with the latest improvement in gas apparatus, as they appointed a Sub-Committee to visit the recent Glasgow Exhibition, and report on what they saw. The deputation returned with a very good opinion of various kinds of gas-burners and cooking stoves, but with a very bad impression of the electric light. This shows how people viewing the same object from various standpoints may arrive at different conclusions. Some persons—not being members of a Gas Committee, or otherwise specially interested in gas lighting—have recorded their opinion that the electric light "held its own" at Glasgow. It may perhaps be said that gas sympathizers, accustomed to steady and diffused light, are apt to disparage a method of lighting which does not claim these among its peculiar advantages; while electricians may disdain these points as unworthy of their serious consideration, probably because of their inability to secure them. In this way it is possible to reconcile the two conflicting opinions, if it is really considered worth troubling about.

We take this opportunity of informing our readers that this is the last "Circular to Gas Companies" which will appear in the JOURNAL. The title has been retained as a relic of the early days of this publication, when it was strictly applicable to the semi-private nature of the contents of these columns. The character of our comments on gas affairs has, however, become so altered in the course of time, that it is felt that the old title is no longer suitable. Gas polity is no more the exclusive concern of Gas Companies, and it is inadvisable to continue a title which, at the first glance, appears to restrict the application of our remarks in a manner which has long ceased to characterize them. Henceforth, although we shall continue to devote the first part of the JOURNAL to editorial reviews of gas matters in general, the broader field which the force of current events compels us to survey, will be best left uncatalogued.

under any precise designation. No specific title will therefore, in future, limit our editorial grasp of subjects connected with the gas and cognate industries; but we shall take the liberty of dealing in these columns with anything and everything which we may consider of interest to gas manufacturers and consumers, to whom, at the close of the year of grace 1880, we wish all prosperity in the year that is about to begin.

Water and Sanitary Notes.

A REPORT is current that the Metropolitan Board of Works will endeavour to induce the Government to adopt a scheme of regulation instead of purchase, with respect to the undertakings of the London Water Companies. It is quite possible a majority of the Metropolitan Board are beginning to perceive that the management of the water supply is a much more formidable affair than has been generally understood. That the Metropolitan Board could not, alone and unassisted, perform the functions at present discharged by the eight London Water Companies is perfectly certain. Supposing a Water Trust to be formed, consisting mainly of representatives from the Metropolitan Board and the Corporation, the members of the former body selected to serve on the Trust would require to be released from all their other duties, and would be practically withdrawn from the work of the parent Board. To enlarge the Metropolitan Board, so as to make up for the deficiency thus occasioned, would be a clumsy expedient. A Water Trust formed without reference to the Metropolitan Board or the Corporation, might deal effectually with the water supply; but the Metropolitan Board cannot be expected to look upon a scheme of this kind with any degree of favour. On the whole, there are very good reasons why the Metropolitan Board should prefer a Regulation Bill to one of purchase. The *Echo*, true to its usual policy, is greatly annoyed at the prospect of such a Bill, and characterizes the proceedings on this subject at the Metropolitan Board as "a little conspiracy." We may be allowed to express our belief that if practical effect should ever be given to the flaming theories advocated by our contemporary in respect to the Water Supply and the Local Government of London, the inhabitants of the Metropolis will have great cause to complain. The difference between London and the largest of the provincial towns of the kingdom is so vast that any attempt to deal with the Metropolis on the plan of the provincial municipalities is to be deprecated, as fraught with dire probabilities of mischief and confusion.

The discrepancy in the analyses showing the amount of solid matter in the water supplied by the Kent Company is explained in Lieut.-Col. Bolton's current report, by the circumstance that the Company have several wells, and among these there is some difference as to the degree of hardness and the amount of solid matter. Although the supply is, to a certain extent, mixed in the mains, it is necessary, if uniform results are to be obtained, that all the samples for analysis should be taken at the same place and at the same time. Truth is generally understood to exist at the bottom of a well; but it appears that where there are many wells it is difficult to get at the truth. However, the Kent Company, who have taken the trouble to explain the matter, point out the fact that whatever variation may be discovered in the nature of their supply, all the varieties of their water are good.

Lieut.-Col. Bolton continues his accustomed statement that "all the Companies are moving in the matter" of the constant supply, "except the Grand Junction Company." The best he can say of this Company at present is, that they "have resolved" upon energetic action, and "propose to" "begin" with sundry building estates and districts. At a later date the Company hope to convert portions of their older districts to the constant system, but they look forward to considerable opposition in carrying out this design. The Lambeth Company are said to experience great difficulty in getting landlords and tenants to make the necessary alterations in their fittings. The Chelsea Company are giving the constant supply on all new estates and new lines of streets, though, judging by the very few applications made for such supply, there appears to be little desire to obtain it, either on the part of public authorities or private consumers.

With reference to the Southwark and Vauxhall Company, Lieut.-Col. Bolton makes a remark that in the event of this Company being at any time unable to deliver a sufficient quantity of water to their district, assistance might be afforded by the other Companies whose works are south of the Thames, who would thus jointly contribute some six or seven million gallons of water per diem. It would have saved

much inconvenience and complaint, if an arrangement of this kind had been acted upon a few years ago, when the filter-beds of the Southwark and Vauxhall Company were partially choked by the sudden growth of vegetable matter during an exceptionally hot period of summer weather. North of the Thames, some of the Companies are, we believe, in a position to feed each other's mains in the event of an emergency. Lieut.-Col. Bolton observes that any arrangement of this kind must be on a voluntary basis, as there is no power to compel the Companies to assist each other. We hope nothing will arise in the future to show that such compulsion is necessary.

The Metropolitan Municipal Association, meeting under the presidency of Mr. E. J. Watherston, with Mr. J. Beal for Honorary Secretary, are prepared to show Sir W. Harcourt what to do with the Metropolitan Water Question. A letter is to be addressed to the Home Secretary, stating that a representative body created out of the Metropolitan Board and the City Corporation "will not command public confidence." Failing the adoption of direct representation, it is suggested that a Parliamentary Commission should be appointed, "composed of very eminent men," with power to acquire the undertakings of the Water Companies, or to establish a new source of supply. It is proposed that this Commission should last until a Municipality for London, or a representative Water Board, is created to take up their functions. Still further to help the Home Secretary, the names are given of individuals suitable to serve on the Commission, beginning with the Speaker of the House of Commons, and finishing with "a leading member of the Stock Exchange." Why this last, we are puzzled to know, unless he is to "bear" the market, and keep down the price of water shares. Concerning the Vestry Delegates assembling at St. Martin's-in-the-Fields, Mr. Watherston desires to see them re-appointed. The proposal for "direct representation" in the constitution of the Water Trust has created a division in the camp, and a fresh start must be made, if there is to be anything like a general delegation from the Vestries and District Boards of the Metropolis on the subject of the water supply. The expectation that the Government will soon attempt to introduce a new system of government for the Metropolis is strongly entertained by the leading members of the Metropolitan Municipal Association, the hope being based upon "the emphatic declaration" made in respect to this subject by Mr. Childers, at the recently-held meeting of the Chelsea constituency.

The immense practical improvement effected during a recent period in the operation of boring to great depths offers peculiar facilities for the utilizing of underground waters—a matter of especial value in those districts where other sources of supply are either scanty or remote. The improved system of boring is happily associated in these days with that accurate knowledge of geological phenomena which in particular cases makes the search for water an enterprise of comparative certainty. Two examples of this description occur at the present time, one being at Fulwood and the other at Walton-le-Dale, both in the vicinity of Preston, the former locality lying to the north-west of that town, and the latter to the south-east. In each case the Local Authorities were advised by Mr. C. E. De Rance, F.G.S., a member of the Geological Survey, as to the site to be chosen, the probable depth at which water would be found, and the volume and quality of the water that would be obtained. The professional counsel thus given has been in each case most remarkably verified. The Fulwood boring was begun on the 5th of October. Mr. De Rance expected that the gravel, sand, and clay would give place to actual rock at a depth of 112 feet. As a fact, the rock was reached at a depth of 121 feet, being only 9 feet deeper than the anticipation. A short time back the boring had reached a depth of over 160 feet, the water standing at 90 feet from the surface. When a depth of 200 feet is reached, it is intended to have a chemical analysis made, and if this proves satisfactory operations will be continued to the full extent advised, which is 300 feet. At this depth Mr. De Rance expects that a pure and abundant supply of water will be met with. At Walton-le-Dale the operations commenced as far back as the autumn of last year, and a trial boring was carried down to a depth of 300 feet. The supply of water thus obtained was found, after pumping had been carried on night and day for three weeks, to amount to 60,000 gallons per diem. The total cost of boring and testing was under £400. Samples forwarded to Dr. C. Meymott Tidy were reported upon in the most favourable terms. The prospect being in every respect satisfactory, application was made to the Local Government Board for permission to borrow £10,000 in

order to carry out the entire project, according to a plan prepared by Mr. C. Tomlinson, Engineer, of Rotherham. At the official inquiry into the subject of the application, conducted by Mr. R. Morgan, Mr. De Rance gave evidence to the effect that the yield from a well 300 feet deep might be expected to amount to at least 400,000 gallons per diem. The scheme being approved by the Local Government Board, the requisite contracts were entered into, and operations were actively commenced in October last. At a depth of barely 50 feet from the surface, a supply of about 100,000 gallons of water per diem has been reached, and the well will be carried down to a depth which will be regulated by the amount of water met with. A reservoir is being constructed, and the requisite boilers, engines, and pumps are being made. The boon to the district, where the water supply has hitherto been scanty and uncertain, will be very great.

GAS LIGHTING AND VENTILATION.

Among the other delinquencies of house builders, their total disregard of the necessity of ventilating living and sleeping rooms is not the least. It is enough to shake the convictions of the most resolute believer in the all-sufficiency of public opinion to effect desirable reforms in our social organization, to observe how builders continue to make profit by building close and stuffy, or bleak and draughty habitations, although the people who live in them have daily experiences of their discomfort and danger. Year after year people endure a style of building houses which makes the supply of fresh air to the interior depend entirely on the imperfect fitting of the doors and windows. By day, at this time of the year, roaring fires have generally to be kept up to protect the long-suffering householder from the effect of the draughts, which in too many cases appear to strike an inmate of a modern room in whatever part of it he may happen to seat himself; while at night, when the gas is lighted, the temperature of the apartment, which has obstinately remained at about 55° Fahr. during the day, speedily mounts up to something over 70°, and when a visitor is admitted he is saluted with a puff of suffocating fumes. It is usual to lay the blame for this state of things upon the gas, which has been a firm friend to the builder in this respect. When the leaks and crevices which are competent to fill a room with draughts by day are found insufficient to supply it with pure air, and also to remove the respired air and products of the combustion of gas by night, it has been so much the custom to look upon gas as the sole cause, that the modern school of æsthetic decorators and furniture mongers, who have taken upon themselves to teach the builder his business in everything else, implicitly follow his lead in this, and endeavour, by discrediting and tabooing gas as inartistic, to avoid the necessity of discovering a thorough system of ventilation for dwelling-houses. The new school of decorators are, in fact, worse foes to gas than the ordinary builder, for while he does not object to it more actively than by constructing rooms in which it can only be burnt at the risk of asphyxiating the inmates, the high-art enthusiasts are quite incompetent to deal with it on rational principles, as, according to their own ideas, they glory in doing with furniture, and they therefore conceal their ignorance of its capabilities by abusing it in all the high-flown phraseology of the school. It was painful to hear such a man as Mr. R. W. Edis, F.R.I.B.A., in the course of the otherwise very sensible lectures on house decoration delivered by him to the Society of Arts last spring, revile London gas in such terms as "vile compound" and the like, which only served to show that, although perhaps a good decorator, he knew nothing whatever about gas illumination. In no other class than that of which Mr. Edis is such a conspicuous ornament is contempt of ignorant outsiders, who attempt to criticize the work of the initiated, carried nearer to the verge of griggishness, and it is no more than a fair reprisal if we suggest that Mr. Edis, when next irritated by a Philistine who does not believe in "dadoes" and is blind to the beauty of blue china, should remember that the disposition to revile the unintelligible is also to be found in himself.

We do not, however, intend on the present occasion to deal with the absurdity of that kind of modern art-teaching which is prone to sneer at anything intended for domestic use that does not date from the reign of Queen Anne, further than to remark that although books on decoration have lately been as plentiful as cookery manuals, the writers do not appear to be capable of telling their readers how to make the best of the advantages offered by the material progress of the day, as compared with the state of the age to which they are so fond of referring. We hear so much of the fine old houses of the early Georgian era, and the decorated interiors of that and a slightly prior time, but we are not so frequently reminded that in those days sanitary science was not in existence, nor are the modern worshippers of the past glories of Bloomsbury and Soho themselves sufficiently imbued with the sanitary sense. Sanitation, of course, means more than drainage. The ventilation of dwelling-houses is a very important branch of what has been expanded into the "science" so named. It is not clear, by the way, that the specializing tendency of the time, which separates human intelligent effort into numberless "sciences," each with its peculiar prophets and their followers, is of unequivocal advantage. There is always, in such cases, the disposition to form a "ring" of interested specialists round the subject, and thus to really narrow the benefits of its application by spreading the impression that only those who can utter the password are competent to deal with the matter. Be this as it may, we find the

patent fact that the sanitarians of the present day are a body quite distinct from the authorities on matters of house furnishing, and the questions cognate thereto, and this is much to be regretted. The subject of ventilation is one on which a fusion of sanitary and decorative principles is desirable, for we find, on the one hand, sanitarians advocating arrangements from their own point of view alone, while, on the other hand, decorators might be pardoned for dismissing some of the proposals of the former on the score of their uncompromising presentment. We hold firmly to the opinion that where health and taste run counter to one another, the latter should give way; but, again, such instances of after antagonism are few. Where one interest clashes with the other, it is by the nature of things, the artistic faculty which should be called upon to make the necessary adjustment. Art can beautify the necessities of life, or it is no art, but its misleading counterfeits, and its professors are quicks. Now we may put the question—Is the art which cannot utilize gaslight and ignores ventilation (among other things) true or false? None will contend that ventilation is unnecessary, and as for the necessity of gas lighting for town populations, the same building which echoed to Mr. Edis's denunciation of gas, has more recently heard Dr. Alfred Carpenter maintain that no town without gas can carry on its work in the world. One preacher condemns that which another seeks to have infinitely diffused. By the testimony of facts we must acknowledge that the latter has a better insight into the truth in this particular. Then, if houses are properly ventilated, gas may be burnt therein without the discomfort attending its use where ventilation is not thought of; and it is even possible to say that, by a proper use of gas, ventilation may be more perfectly secured than by any other means.

We have before us a pamphlet by Mr. Lawson Tait, F.R.C.S., reprinted from the Transactions of the Birmingham Philosophical Society, in which the author describes and figures an arrangement embodying the principle of the Tobin tube, for the ventilation more especially of bed-rooms, but which may, of course, apply to other apartments. A tube of thin sheet metal, about 4 feet in height, is fixed in a corner of the room, with an elbow at its lower end communicating through the wall with the outer air. This elbow is warmed by an atmospheric gas-burner, and is packed loosely with crumpled iron wire or metal clippings. The pipe is encased by another, similarly constructed, which is open at the bottom, but closed at the top, where it terminates about an inch below the top of the inner tube. A branch pipe from the upper portion of the outer pipe communicates with the air. The action of this apparatus is easily understood. Fresh air enters by the inner pipe, and is at once warmed and directed to the upper part of the room, displacing the foul air, which descends and enters the bottom of the annular tube, and passes out at the upper branch pipe. Thus by the aid of a little gas heat the air of an apartment fitted with this arrangement is continually being changed, while the room itself is kept pleasantly warm. As to the appearance of this description of ventilating stove, nothing can, of course, be said. It is not necessarily ugly, but if it answers its purpose, as the author contends that it does, it is surely a fit subject for decorative treatment. That gas can be anything else than a nuisance in a living or sleeping apartment will perhaps be news to many; but we, who believe that its more extended capabilities are only now being explored, welcome the smallest addition to its acknowledged uses, especially in the direction of household sanitation.

MR. HENRY WEBB, for many years one of the Auditors of the Commercial Gas Company, died on the 30th ult., aged 70 years.

As an example of the estimation in which the stock of the Sheffield United Gas Company is held in the borough, it may be stated that on Tuesday last Mr. Nicholson submitted for sale by auction £420 class of "C" stock in the Company. For it £190 per £100 was bid; but as no higher price was offered, the lot was withdrawn.

WE (Manchester Guardian) are informed that the memorial for the mitigation of the sentence on Frederick Hoyton, late Chief Clerk and Cashier in the Water-Works Department of the Manchester Corporation, has received 6000 signatures, and that it will be presented to the Home Secretary by Mr. John Slagg, M.P., early in January.

THE WATER SUPPLY OF CONNETT.—At the last monthly meeting of the Benfieldside Local Board, the Chairman (Mr. J. Annandale, jun.), said the Clerk had written to the Consett Water Company, calling their attention to the report of Mr. Stock, the County Analyst, and requesting to be informed if it was their intention to stop the water supply to the public. A similar question had been asked by the Consett Local Board, but the reply in each case was the same—that they believed the water submitted to Mr. Stock was taken from the reservoir at a time when there was flood water in it; that, in consequence, the water contained a larger quantity of vegetable matter than was usually found; but that, at the same time, the Company would do their best to make the water as pure as possible. Dr. Renton said the death-rate of the township had never been lower than it was at present, and if the water had been impure, as represented by Mr. Stock, they might have expected to find some demonstration of the fact in the health of the people. Mr. Carrs said according to the Company's Act they were bound to supply pure and wholesome water. What was the penalty if they did not do so? Mr. Carrs said the Local Government Board could compel the Company to supply pure water. The Company failed to do so, then, with the authority of the Local Government Board, the Sanitary Authorities in the district could take the matter out of their hands altogether, and provide a separate supply. He thought that three Local Boards in the district ought to take joint action in calling the attention of the Local Government Board to the present unsatisfactory supply of water, and be concluded by moving a resolution to this effect. Mr. Lawson said the Consett Local Board had already sent a copy of Mr. Stock's report to the Local Government Board, and asked if any reply had been received? Mr. Smith said none had arrived up to the present time. After some further discussion, it was decided to let the matter stand over until next month, by which time it is expected a reply will be received from the Local Government Board.

Notes.

[This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.]

CONVERSION OF NON-LUMINOUS INTO LUMINOUS GAS-FLAMES.

At the recent meeting of the German Association of Naturalists, at Dantzig, Dr. Blockmann raised the question of the reason why the non-luminous gas-flame of a Bunsen burner becomes luminous when the mixture of air and gas is heated. As reported in the *Chemiker Zeitung*, Dr. Blockmann stated that if on the top of a Bunsen burner a platinum tube is placed, and this tube is heated to dull redness by another burner, the previously non-luminous mixture of air and gas will become luminous, even to the extent of ordinary coal gas. The ordinary explanation of the phenomenon is that, whereas luminous gases may be made to burn non-luminously by the addition of air, nitrogen, aqueous vapour, or other means for the withdrawal of heat, conversely non-luminous flames can be made luminous by the addition of heat. This explanation did not satisfy Dr. Blockmann, and he therefore analyzed the mixture before and after heating, in order to determine whether or not any chemical change was caused by that operation. Before heating, the mixture contained about 60 per cent. of air and 40 per cent. of coal gas. After passing through the heated tube the greater part of the hydrogen and all the oxygen had disappeared, the light and heavy hydrocarbons of the gas showed only a slight decrease, and the carbonic acid a slight increase. The products of combustion were 22.2 volumes of steam and 1.4 volumes of carbonic acid. The arrangement was now changed, the same platinum that had been used as a tube was rolled in a spiral form, and packed into a refractory glass tube of the same diameter as the Bunsen burner. The gas mixture was then passed through and the tube heated, when, even by daylight, the platinum foil was seen to remain red hot after the external flame was withdrawn, and water collected in drops in the cooler part of the tube. The gas mixture which had passed over the heated platinum contained only 20 per cent. of inflammable constituents, with 55 per cent. of nitrogen and 25 per cent. of products of combustion, and was generally on the verge of ignition. The flame was non-luminous, and appeared to have been partly destroyed, nor could it be made luminous by warming from the outside. Again, after mixing gas and air in a holder, it could not be rendered luminous by passing it through a heated tube, however much the tube was heated. From these and other considerations the experimenter became convinced that the mixture of gas and air could not be rendered luminous by heating, but that the apparent effect was due to the fact that, by heating the tube, the movement of the mixture inside was affected so that the air was partially or entirely prevented from entering the holes at its base, and that therefore the so-called luminous mixture was really the pure gas from the pipe.

ANOTHER NEW GAS-ENGINE.

Mr. W. Foulis, the Engineer-in-Chief to the Glasgow Corporation Gas Commissioners, will shortly bring before the public a new gas-engine of his invention. The machine may be said to have already passed the experimental stage; for a number of professional gentlemen, who have been permitted to see a model at work, declare that it is a decided step in advance in this line of invention. The engine is an example of valvular arrangements being reduced to a minimum, and one of its essential features is that it partakes largely of the character of a heat engine, and does not depend so much on the explosive action of the mixture of gas and atmospheric air as is common in most other types of gas-engines. Very shortly a new engine ready for actual use, made from Mr. Foulis's designs, will be finished, when a fuller account of its construction, together with results in action, will be given.

A METALLIC GAS FIRE.

Mr. James Hislop, the Manager of the Partick, Hillhead, and Maryhill Gas Company, has just devised a new form of burner for gas fires as used in open grates with asbestos composition. The burner, or, as Mr. Hislop calls it, the "metallic gas fire," has a dark brick-red colour, which seems to indicate that aluminous oxide of iron is used in its composition; but whether or not there is any fire-clay along with it we are unable to say. It is the case, however, that after being used for several months the burners become exceedingly hard, almost like cast iron, or better still, like a very hard-burned fire-clay. In shape the burners are oblong masses, hollow internally, and having in front and at the ends a series of terraces, in the angles of which are the perforations for the exit of the mixture of air and gas. So far as they have been used hitherto, these burners have proved to be very successful; they are entirely free from smell. Mr. Hislop, who has been studying and experimenting on this matter for a number of years, seems to have fallen upon a most ingenious method of burning the gas. It is certain he manages to heat the gas to a great temperature before combustion; and he claims to have succeeded in attaining the maximum of heat with the minimum of gas consumption. The burner is scientifically adjusted so as to be suitable for the burning of either Scotch or English gas.

THE UTILIZATION OF SMALL COAL.

A suggestion appeared in a recent number of the *Newcastle Chronicle* with respect to the conditions under which Wallsend coal is brought into the London market and to other ports. Much of the

coal of this class is very small, and when screened at the pit's mouth, previous to shipment, as much as 30 to 40 per cent. of small is sometimes taken out of it. Again, in the dealers yards, before being retailed, it is subjected to further screening, which takes out about 20 per cent. Hence not more than 50 per cent. of the coal obtained from the Durham pits is actually sold to householders for domestic use, the remainder being disposed of at a much lower price. It is suggested that it may not be really necessary to screen the coal prior to shipment, but that the difference in the amount of loss between double-screened and single-screened coal may perhaps pay for the carriage of the whole, taking account of the lower cost at which through-and-through coal can be supplied. Otherwise it is proposed to partially carbonize at the pit's mouth the small coal taken out, so as to make a superior kind of coke or consolidated moulded fuel, saleable weight for weight at equal prices with the large coal. It is not intended to carry the carbonizing process very far—merely to the extent required to cause the small coal to cement itself together by the aid of the tar, just as it is caused to flow. There would be in the process an evolution of gas, which, in default of other uses, might be caused to heat the retorts; and any ammoniacal liquor distilled over would also be preserved. The fuel thus made would, in reality, be coal of a less bituminous character than that employed in its fabrication, and it might, of course, be moulded in any required sizes. As this proposal requires certain appliances, not at present in use, to be specially devised, an alternative scheme is that of carbonizing the small coal direct to coke, but without carrying the process quite to the extent practised when gas is sought as the chief product of the destructive distillation of coal. It is considered that the Durham coal refuse, for such it practically is at present, will, in either of these two ways, become very much more valuable than the small coal of South Wales, of which patent fuel is made. The proposals somewhat lack novelty, but they go to show that an old source of loss to the fuel producer and consumer of the country is still unchecked.

THE COMPOSITION OF CONDENSED WATER.

According to Mr. Isherwood, Chief Engineer in the United States Navy—a communication from whom on results of certain experiments with a tubulous boiler of the "Roots" class appears in the *Journal of the Franklin Institute* of the current month—an alkaline feed water, the alkalinity of which was, however, subject to destruction when the solid matters dissolved in it were calcined, exerted a curious effect on the iron of which the boiler and surface condenser were composed. An examination of the water of condensation drawn from the surface condenser showed it to be strongly acid, and containing iron, while the water in the boiler from which it was distilled was alkaline and free from iron. The acid was found to be carbonic acid, and the iron was in the form of carbonate of iron, and evidently came from the iron tubes of the surface condenser. The action of the distilled water on these tubes was so rapid, that although when condensed the water was perfectly clear, after standing one night in the condenser it was discoloured and ochreous in the morning. This water, after the removal of the acid and iron, was absolutely pure. If the water was allowed to stand, the acid left it spontaneously, and at the end of about 15 days was almost entirely gone. Mr. Isherwood states that he has observed the same destructive action of the water of condensation on the cast-iron casing of surface condensers of other engines, due to the gaseous acids brought over with the steam from the boiler, and dissolved anew in the distilled water. Hence it is quite an error to suppose that the condensed water derived from a surface condenser of an engine in ordinary use is pure water because it has been distilled, even if it be not greasy; it is, in fact, acid and ochreous.

LIGHTNING A CAUSE OF COLLIERY EXPLOSIONS.

An important communication by Mr. Canning, of the Gas-Works, Newport, Mon., on the subject of colliery explosions, appeared in the *Western Daily Press* of the 21st inst. The writer visited the Risca pit on the day after the disastrous explosion in July last, and became suspicious, from the statements of residents in that locality, that the accident in question was due to a discharge of atmospheric electricity into the mine. In conjunction with Mr. Thomas, the writer conducted during the following month a series of experiments to determine the action of electrical currents in wires when surrounded with explosive gaseous mixtures, with the view of estimating the probable action on the unstable atmosphere of fiery mines of the hoisting wire, and the continuous metallic conductions between the interior of such mines and the external air, when these wires are charged, directly or by induction, with electricity at a high potential. The experiments were admirably adapted to attain the desired end, and, from their simplicity, can be easily repeated by any one desirous of satisfying himself of the accuracy of Mr. Canning's observations. He used an ordinary induction coil and three Grove's cells for the production of the electricity. The wires from the coil terminated in small brass knobs. When the coil was connected up in the usual way, a stream of coal gas from a burner attached to a flexible tube was ignited on approaching the insulated wire. When the wire was not insulated, the same effect was produced, with the difference that in this case the ignition was effected by a lump of coal placed in contact with the wire. Small coal in the neighbourhood of the charged wire gave rise to a continued exchange of sparks. Finally, a box containing an explosive mixture of gas and air was exploded by the electrical discharge between a wire and a quantity of coal dust sprinkled over the bottom of the box. This evidence appeared so conclusive to Mr. Canning that, in conjunction with Mr. Thomas, he has obtained a patent for a protecting roof to cover colliery heads, to prevent direct or induced electrical dis-

charges taking place in the winding wire, and also for a discharging apparatus for taking off electricity from such wires when the roof is not used. It will be remembered that Mr. W. H. Preece expressed his conviction that lightning was the agent that brought about the Risca explosion, and he has also stated his opinion concerning the danger of introducing the electric light or, indeed, any apparatus requiring intense electrical force, into mines where fiery mixtures of hydrocarbon gas and air may be suspected. Mr. Canning quotes this opinion of Mr. W. H. Preece, which he considers has been amply justified by his own observation, that a spark is not always necessary in order to fire a stream of ordinary gas.

Communicated Article.

FOG AND SMOKE.

By Mr. H. LEICESTER GREVILLE, F.I.C.

The grumblings of the British Public concerning the heavy fogs which, at certain periods of the year, infest London, in common with other cities where bituminous coal is burned in large quantities, have at length taken a tangible form. By the constitution of a Fog and Smoke Committee, it is to be hoped that, if no absolute cure for an intolerable nuisance is discovered, the scientific bearings of the question will be discussed, and many valuable suggestions made. The Committee starts with the double advantage of possessing scientific men of eminence among its members, and of being under loyal patronage, and will therefore no doubt not only perform useful work, but command the attention of the public to its labours.

It is well to see the enrolment of such a practical man as Mr. Harris on the Committee, for it is advisable that the gas companies should have a suitable representative. The interest they naturally take in the matter has been spoken of, inasmuch as it is believed that the present discussion will tend to increase the consumption of coke as fuel for domestic purposes, and make the employment of gas fires more popular. It will thus extend that consumption of gas during the day which is considered so desirable by gas companies.

In studying the general question of fog and smoke, the evidence upon the connection of the two has first to be considered; and, secondly, the suggestions for preventing their occurrence. With regard to the origin of fogs, they are, no doubt, peculiar to districts in which exist large congregations of houses where bituminous coal is consumed. The white mist which is occasionally met with in country districts is totally different in its character from the orange-coloured, dense vapours which occasion bronchial irritation, and materially increase the average death-rate during the period of their continuance. The country mist is in all probability nothing more than partially condensed aqueous vapour. It is, in reality, an atmosphere highly charged with moisture, cooled to a degree sufficient to separate a large proportion of the aqueous vapour in the form of fine particles of water—a condition analogous to that which is produced when a jet of steam is blown into the air. In the case of the regular city fog, it appears probable that the same basis exists, but the condensed water particles are enveloped in films of condensed hydrocarbons, having their origin in the incomplete combustion of the bituminous coal used in ordinary domestic fireplaces. This hydrocarbon film surrounding each particle of condensed water retards the coagulation of the individual particles, and consequently causes the persistency of the fog to be greater than that of simple mist. It is to the presence of these tarry hydrocarbons, in fact, that fog not only owes its peculiar persistency, but also its specially irritating action on the throat and lungs. In addition to the condensed hydrocarbons in fog, a certain amount of solid and finely-divided carbon particles is present, which tends to increase its objectionable character.

As to the origin of fog, it can thus be intimately connected with the smoke and other products arising from the incomplete combustion of bituminous coals. On the question of the particular atmospheric conditions favourable to the accumulation of fogs, there is less known; a moisture-laden condition of the air, combined with extreme stillness, are probably among the most favourable conditions. Under these circumstances, the combustion products arising from the numerous house fires, instead of ascending and dispersing as is generally the case, pour directly downwards as soon as they become sufficiently cooled to acquire the requisite density. Thus a comparatively dry condition of the air, combined with a certain amount of atmospheric agitation, tends to a rapid dispersion of the combustion products, while a still and moisture-laden atmosphere tends to their rapid condensation and descent.

Having pointed out the probable origin of fog, it remains to deal with the best methods for its prevention. It is so obvious as scarcely to need further comment, that the first step in the direction of fog-prevention is to stop, or at least to limit, the amount of smoke and incomplete combustion products escaping into the air. It is, however, not so obvious how this desirable end is to be attained, consistently with economy and general convenience. In the first place, one of two things must be done—either the use of bituminous coal for household purposes must be dispensed with, and we must abolish the cherished and old-fashioned domestic fire, with its cheerful jets of bright hissing flame, and substitute a smokeless fuel in its place; or the construction of the ordinary fireplace must be so modified as to ensure more perfect combustion and the prevention of smoke. Of the two methods, the one adopted will have to depend upon special circumstances and upon individual taste and discretion. No efficient plan has yet been advocated with the requisite publicity, for consuming bituminous coal in an ordinary fireplace so as to produce little or no smoke. In all probability the difficulty might be

met by having an arrangement by which the draught could, by means of a damper, be so regulated as to be allowed to act from immediately above the fire, as is now the case, or could be shifted so as to act from underneath the fire, and thus to draw all smoke and incomplete combustion products through the already incandescent fuel, and so effect their complete combustion. If the use of bituminous coal is to be dispensed with, it will be necessary to consider what substitute could be employed. In the first place, it should be pointed out that ordinary anthracite cannot be used in place of the regular house coal in a common fireplace, as it requires an exceedingly strong draught to effect its combustion. Some of the denser varieties of anthracite possess a further disadvantage in splitting into thousands of small pieces on the first application of heat. It is the more necessary to draw special attention to these details, inasmuch as several gentlemen connected with the anthracite industry are moving in the matter, and in ordinary grates a trial of coal of the description alluded to could only end in disappointment.

Among the descriptions of coal which it is possible to use in ordinary fireplaces where a good draught exists, may be mentioned the bestkinds of steam coal obtained from the neighbourhood of Aberdeen, Merthyr, Bryn Ferry, and Taff Vale. With such coals the poker may be dispensed with, as well as the eventual services of the sweep. Gas coke is also a fuel, the use of which in private houses might be extended with advantage. A prejudice exists against coke, on the grounds of its containing more sulphur than ordinary coal, and of its being more difficult of ignition. The objection of a little extra trouble in lighting a fire may be at once disposed of as scarcely worth consideration. With regard to the question of sulphur, there is no doubt that the products arising from the combustion of ordinary gas coke are unpleasantly sulphurous in their nature, but this is of little consequence, provided they are not allowed to escape into the room, and in order to ensure that the only essential is a good draught. The writer has frequently used coke as a fuel, in an ordinary sitting-room where the chimney possessed a good draught, and not the least inconvenience was ever experienced from the combustion products. At the same time it must be admitted that the construction of the majority of domestic fireplaces is such that a difficulty is generally experienced in the use of other than freely-burning fuels, it being difficult to ensure an efficient draught directly through the combustible material. So much, indeed, is this the case, that even in the use of free-burning coals, and with a well-constructed chimney, considerable inconvenience is occasionally experienced. The best of the present fireplaces are more or less erratic in their action, working well perhaps for days, and then suddenly, on the advent of a slight gust of wind, the room is filled with smoke, and the inmates are half suffocated.

If the present arrangement of domestic fireplace is examined, it will be found that the entrance to the chimney, where the so-called regulator is placed, is an orifice of varying dimensions. Below this, at some distance, is the grate, while an open space facing and communicating with the room lies between the grate and the chimney. When an upward draught is caused in the chimney, the partial vacuum formed at its lowermost extremity is supplied by the air of the room, which has a tendency to enter at the point of least resistance. This point of least resistance is undoubtedly the open space between the entrance to the chimney and the grate, so that by far the greater quantity of the air passing up the chimney does not perform useful work by passing through the combustible material in the fireplace, but takes a different channel. As a natural sequence the current requires to be largely in excess of that absolutely necessary to supply the fire with air in order to remove the whole of the combustion products, and should any cause arise to check this current, the immediate effect is the escape of a portion of the smoke into the room, in place of the whole of it passing up the chimney. Not only is this the case, but the comparatively small quantity of air which actually passes through the fuel renders it difficult to satisfactorily consume such combustible materials as require a strong draught. A very slight modification of the existing arrangement would meet the exigencies of the case, and enable such fuel as coke or steam coal to be consumed with perfect facility, at the same time that the inconvenience of a sudden puff of combustion products into the room would be avoided. The modification is this: Let the open space in front of the chimney be partially or wholly closed by a sliding plate of sheet iron, so that the major portion of the air ascending the chimney is compelled to pass actually through the fuel in the grate. The open fire would still be visible, the only alteration being in the space above the fire, and between it and the chimney. The suggestion is not a novel one, being, in fact, the principle adopted in the so-called closed stoves, but it is surprising to find such a simple device not more generally adopted.

Having pointed out the mode by which an ordinary domestic grate could be simply and inexpensively modified so as to adapt it for the consumption of the smokeless and less combustible varieties of fuel, attention may shortly be called to gas stoves. Of these the various descriptions are very numerous, but there is no doubt that, as a substitute for the ordinary coal fire, nothing will find so much favour with the general public as the customary open fireplace provided with gas-jets playing upon some material, which is thereby rendered incandescent, and thus made to resemble an ordinary fire. In this direction the recent suggestion of Dr. Siemens is of great value. That gentleman has pointed out that a greater heat is to be obtained from burning the coke and the gas produced from a certain quantity of coal than can be procured by the direct consumption of the same quantity of coal in the ordinary way. In furtherance of this view he proposes to substitute soft anthracite, or coke, for the asbestos or fire-clay generally used in gas fires, so that the double heat arising from the combustion of the gaseous and solid fuels is obtained simultaneously. Dr. Siemens has given the scheme a

practical trial in a modified form of fireplace, and has found it eminently satisfactory not only as regards heating effect, but in its cheerful and bright appearance, the gas supplying the flame that would be lacking in the combustion of solid fuel alone.

With regard to the general difficulties attending the prevention of fog and smoke, the question is no doubt a national one, but the adoption of any preventive measures will have to be more a matter of enlarged public feeling than a question of legislation. While it seems only reasonable that the Legislature should have firm powers to prevent large manufacturers from pouring forth noxious vapours or thick smoke in large quantities, and contaminating the surrounding atmosphere over a considerable area, it is by no means equally demonstrable that it would be desirable to exercise a similar control over small private establishments. Englishmen are proverbially jealous of their boasted national liberty, even if an extreme freedom of action occasionally interferes with the comfort and welfare of those around them, and most people are, as a rule, content to suffer some inconvenience from others, provided that they themselves can exercise similar privileges of annoyance. It need only be added that the Fog and Smoke Committee deserve all success in their labours, and it is to be hoped that some practical good will, sooner or later, reward the attention which is now being given to the subject.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE OXIDATION OF SULPHUR IN COAL GAS.

Sir,—In the leader with which your issue of the 14th inst., you honoured my short note on "The Sulphur in Coal Gas," there are a few points on which I must ask you to allow me to comment. I will touch briefly on (1) the chemistry of the subject, (2) the facts connected with it, and (3) the position I myself have taken up. These points, then, *seriatim*.

You say "the sulphur in coal gas is burnt to sulphur dioxide." This, of course, is quite correct. Then you say, "itself a harmless body at ordinary temperatures." This is scarcely a correct description of a gas which will not support life, will not support combustion, and which was so familiar to the noses of users of the old lucifer matches. You are quite correct in your estimate of the action of the Referers Sulphur Test, as worked in the usual way with ammonia or other alkali; but scarcely so when you say that if pure cold water be substituted for the alkaline solution, no sulphuric acid is found. Sulphuric acid is found in the water so used, though only a little of it is condensed; the bulk escapes with the other products of combustion. Your precise description of the formation of an individual drop of sulphuric acid on the globe surrounding a gas-jet is also very clear, and I myself have never observed such formation except in a rather odd situation; but the ammonia of the gas has nothing whatever to do with it, and it did not, and does not take a month to form one drop, but a dozen or a score will form in a week. Now, I do not, in my paper infer that because drops of sulphuric acid form under certain circumstances on a glass globe, they form on all the objects of a room which is lighted with gas. To form actual "drops," you must, of course, have the presence of moisture, and a somewhat cool surface; but I did state in my paper that the action of sulphuric acid on pictures, hooks, &c., will take a long time "if the ventilation is very good, and the walls of the apartment perfectly free from any dampness; and a short time when these two conditions are unfavourable, especially where the walls, or portions of these, are not perfectly dry, the presence of moisture naturally favouring the formation of sulphuric acid, and also absorbing it when formed, and assisting its action."

Your explanation of the non-saturation of the air (in houses and rooms) with moisture, and the indication of this by the wet and dry bulb thermometer, is quite correct and admirably lucid. The heating of the air by the gas does make that air to be farther removed from its saturation point, because hot air will hold more water in solution than cold air; but at the same time the combustion of the hydrogen of the gas causes the air of such rooms to contain a "larger percentage amount" of moisture than before. The consequence of this is not that the bulk of the sulphur "is swept away as sulphur dioxide in the ordinary ventilation of the room," but that the sulphur is present in the vapour of sulphuric acid, the sweeping away depending, of course, on the efficiency of the ventilation. Observers have been occasionally led away by inferring that such a high boiling substance as sulphuric acid would not exist in a state of vapour at the ordinary temperature of about 60° Fahr.; but this is a very elementary notion. They evidently forget that substances give off vapours at temperatures immensely below their boiling points—water, as an example, giving off vapour far below the temperature at which it exists as ice.

The position, then, which I take up in this—(1) That the whole of the sulphur from an ordinary jet of coal gas, except whilst within a zone of about a foot from the flame, exists as the vapour of sulphuric acid. (2) That sulphur dioxide cannot be proved to exist beyond this distance from the gas-flame. (3) That more or less sulphuric acid is liable to deposit on any object of a room, which is at all hygroscopic, or which at any time may be lower in temperature than the air of the room. (4) That wood, canvas, ordinary woollen and cotton fabrics, paper, leather, &c.—when in good condition—contain about 8 per cent. of hygroscopic moisture natural to them. (5) That all these articles and metals, when placed in the upper part of a room where gas containing much sulphur is burned, are liable to the action of sulphuric acid unless the ventilation is perfect. (6) That perfect ventilation will not confer immunity from this danger in presence of moisture.

If you, Sir, or any of your readers feel inclined to question any part of this opinion, I feel sure I shall be able to adduce sufficient authority to convince you and them.

I have only to add that it would appear, from a so far uncontradicted statement of the Leeds Public Analyst, that whilst I was crediting the Manchester gas, which I burn, with only 10 grains of sulphur per 100 feet,

it contains some 46 grains, the Leeds gas (according to the same authority) containing some 22 grains. The difference in the effect of burning 46 grains and 10 grains of sulphur I should be prepared to find is considerably greater than that presented in the mere numerical ratio; and I have a hope that by a wise direction of their energetic gas engineers will be able to reduce, sooner or later, the sulphur in gas to a number approaching still nearer to nothing.

Manchester, Dec. 18, 1880.

H. GRIMSHAW, F.C.S.

[With regard to the statements in the above letter, we may remark that the expression "harmless," applied to sulphur dioxide, was only used in reference to the alleged destruction of furniture by the oxidation products of sulphur in coal gas. If the discussion had been on sanitary matters, we might with reason have called sulphur dioxide a "useful disinfectant." Mr. Grimshaw is correct when he says that pure water, used in the Referers Sulphur Test (without ammonia), will retain some of the sulphur as sulphuric acid. We did not deny this fact. What we did state was that "when the products of combustion . . . are drawn through an excess of pure cold water, no sulphuric acid is found." This statement requires, perhaps, some explanation.

The water must be in large quantity (to keep cool), and must contain no dissolved oxygen. Now, since freshly-boiled water will gradually dissolve oxygen when the products of combustion of a gas-flame, mixed with excess of air, are caused to bubble through it, it is necessary to keep the water charged with some neutral gas, such as carbonic acid, to prevent the slight solution of oxygen which, in the liquid state, oxidizes the sulphurous to sulphuric acid. From Mr. Grimshaw's description, we imagine his gas-jet and shade must be subjected to a succession of very cold draughts, sufficient to cool down the shade globe by "several points" several times in the course of the gas test. Under such circumstances it is, of course, possible that the phenomenon we described as ordinarily occurring once each evening, at the lighting of the gas, take place on each successive chill. We need only remark that gas shades in rooms are not generally under such conditions. With regard to the "vapour of sulphuric acid," we believe Mr. Grimshaw to be distinctly wrong. So far from considering sulphuric acid to be present as a vapour in the atmosphere of a gas-lighted room, we doubt whether a molecule of sulphuric acid (H_2SO_4) ever exists in the state of vapour for more than an infinitesimally small interval of time. When pure sulphuric acid is gradually warmed, it begins to fume about 30° C., giving off sulphur trioxide (SO_3), showing that at this temperature the compound suffers some decomposition. From its vapour density there can be no doubt that at 40° C. sulphuric acid does not exist as a vapour, but is completely decomposed into steam and sulphur trioxide. It is possible to distil sulphuric acid, because the molecules of steam and sulphur trioxide, dissociated and volatilized by the heat, re-combine, on cooling, to form a liquid molecule of sulphuric acid in the condenser. It is, indeed, conceivable that some sulphuric acid should exist in the atmosphere of a gas-lighted room, suspended as a cloud of small liquid particles, formed by the direct union of gaseous sulphur dioxide, steam, and oxygen. But there is no evidence that such direct union of the gases takes place. When a bottle of sulphurous acid is opened, and the sulphur dioxide allowed to escape into the moist air of a room, no visible cloud is produced, as is the case with hydrochloric acid gas, which, owing to its affinity for water, condenses the aqueous vapour and forms a cloud of minute drops of aqueous hydrochloric acid. The absence of the visible cloud seems to show that steam and sulphur dioxide do not combine to form liquid particles of sulphurous acid. Again, dry oxygen and dry sulphur dioxide do not unite at ordinary temperatures, and, therefore, we have no reason for presuming *a priori* that the three bodies would unite when mixed together in the gaseous state at the ordinary temperature. The fact admitted by Mr. Grimshaw, that, when pure water is used in the Referers apparatus, only a small portion of the sulphur is found as sulphuric acid in the water, seems to us strong evidence against the theory that all the sulphur from a gas-jet "except whilst within a zone of about a foot from the flame" gets oxidized to sulphuric acid. The sulphur could not pass through the condenser either as a cloud of sulphuric acid or as sulphur trioxide vapour. We heartily concur in Mr. Grimshaw's hope that gas engineers will so improve their methods of purification that the sulphur question" will very soon become a forgotten controversy.—Ed. J. G. L.]

Legal Intelligence.

LIVERPOOL CITY SESSIONS.—SATURDAY, DEC. 18.

(Before Mr. J. B. ASPINALL, Q.C., Recorder.)

THE APPLICATION TO REDUCE THE CITY WATER-RATE.

At the last sessions an application was made by Mr. Segar (see ante, p. 852), on behalf of Mr. John Murphy, Secretary to the Liverpool Land and House Owners Association, under the Liverpool Water-Works Act, 1847, to have a reduction made in the rates and charges for water supplied in the city. On that occasion Mr. Segar maintained that the Corporation had accumulated something like £200,000 over and above the requirements of the water-rates, which sum they lent to themselves and paid interest for, although the only powers they had for raising money were, first, to pay off the debt upon mortgages; secondly, for the purpose of supplying water; thirdly, for the purpose of keeping the supply going by the necessary repairs. On these grounds he asked the Recorder to reduce the rate after inquiry, which he was authorized to make, into the water accounts. To this Mr. McConnell, who appeared for the Corporation, replied that the Court had no jurisdiction, the machinery provided by the Act relied upon by Mr. Segar having been repealed by a subsequent Act—the Liverpool Corporation Water-Works Act, 1862. The Recorder reserved his decision, until the present sessions, and to-day the case again came before the Court, the same Counsel appearing for the parties.

The Recorder, after giving judgment, referred at considerable length to the various Acts of Parliament which were material to the issue, and said if the Act of 1847 had stood alone there would have been no doubt as to his jurisdiction. But there were several subsequent Acts which placed the Corporation under different obligations, and made separate and distinct provision for meeting them, without any reference to the provisions of the Act of 1847 for the exercise of the powers of Courts of Quarter Sessions, and the result would have been that it would have been almost, if not absolutely impossible at this stage of the water accounts to

have exercised the power conferred by the Act of 1847. There appeared to be some important matters with reference to this question in some of the other Acts as well as the two referred to. When, however, he came to the Act of 1862, there was a special enactment, upon which Mr. McConell relied, that the action of the Council should be final and conclusive upon all points concerned. He was therefore bound to rule that, if not in set terms, at least by necessary implication, the provisions of the Act of 1847 had been repealed. In coming to this conclusion, he was extremely glad that it could do very little harm to anybody, because, as he refused to exercise jurisdiction, a *mandamus* would lie, and the applicants could have no difficulty in setting him right if he was wrong. He thought it was perhaps fortunate that he was able to deal with the question in this way, because it afforded the cheapest and easiest mode of setting it right. He must refuse to hear the application any further.

BURNLEY BOROUGH POLICE COURT.—WEDNESDAY, DEC. 22.

(Before Messrs. R. HANDSLEY and G. HASLAM.)

RAWLINSON v. CORPORATION OF BURNLEY.

In this case proceedings were instituted by John Rawlinson, now a machine broker, but formerly a mill manager, cotton spinner, and manufacturer, the ground of complaint being that the Corporation had illegally discontinued his supply of gas.

Mr. KNOWLES appeared for the complainant; the TOWN CLERK (Mr. A. B. Creeke) defended.

Mr. KNOWLES said these proceedings were taken under section 198 of the Burnley Borough Improvement Act, which stated that any person having a supply of gas should give proper security for the payment of the estimated rent for three months, and the Corporation should be liable to a penalty not exceeding £5 if they discontinued the supply of gas unless the conditions for giving them security. For some time previous to the month of August, Mr. Rawlinson did not have a house at Burnley, but in that month he became tenant of the house No. 8, Canning Street, and made use of the gas-meter in it up to the 26th of October, when a servant of the Corporation, named Crabtree, called and plugged the gas-tap with tallow. Shortly afterwards the Corporation served Mr. Rawlinson with a demand note for the gas that had been supplied; and this demand note Mr. Rawlinson discharged on the 24th of November. There had been no demand for security as the section provided, hence he (Mr. Knowles) submitted that the Corporation were wrong in acting as they had done.

The TOWN CLERK took a preliminary objection to the case proceeding. He said the jurisdiction of the Magistrates only arose in the event of the Corporation discontinuing to supply gas, or refusing to supply "for want of security." They had not asked for any security, and therefore the case contemplated by the section which had been quoted did not arise.

At the close of this section were these words: "And the Corporation shall be liable to a penalty not exceeding £5 if they shall discontinue to supply to any person not having a supply for want of such security." Now no such security had been demanded, and the Corporation had not asked for it.

Mr. Crabtree, one of the meter inspectors in the employ of the Corporation, was then called on behalf of the plaintiff. He said it was part of his duty to go round and take the state of the meters. On Oct. 26 he called at No. 8, Canning Street, and, after ascertaining what quantity of gas had been consumed, he stopped the gas from entering the meter.

Mr. HANDSLEY (addressing the TOWN CLERK) said: I do not know, after this evidence, and seeing that there was no security asked for, how you can defend the case.

The TOWN CLERK: But the Magistrates have no jurisdiction in the matter.

Mr. HANDSLEY said he did not agree with the TOWN CLERK on this point, as the case seemed perfectly clear to him. The Corporation were liable to a penalty if they discontinued the supply of gas "for want of such security." They had never asked for security, so that this part of the section did not apply at all.

The TOWN CLERK (meaning I attach to the clause is this: That if we had refused to supply gas for want of security, then we should have been liable to a penalty unless we could prove that we had demanded the security and it had not been given for seven days.)

Witness (continuing) said the book in which he entered the consumption of gas that had taken place was kept properly for removals, although it also contained the names of those who had not removed, if they had not paid all the arrears they owed. He did not ask the complainant for any security, as that did not lie in his power.

The TOWN CLERK: Did you know before you went to the house that the defendant was living there?

Witness: Yes. How long before did you hear?—I took the state of the meter at a house kept in complainant's wife's maiden name, I believe (Agnes Tasker), at No. 39, Forest Street.

Mr. NOWELL (Magistrates Clerk): Was the gas rent in arrears there? Witness: Not that I am aware of. Proceeding, witness said he could not tell when he took the state of the meter at No. 39, Forest Street, but one of the other meter inspectors finding that John Rawlinson was using gas, witness was directed to go and cut off the supply.

Mr. KNOWLES intimated that he should be able to prove that Agnes Tasker was not the complainant.

Mr. HANDSLEY: It is just as well to show that, because the inference here is just what the Corporation wish to draw from it. But how the Corporation are prejudiced when the gas has all been paid for at No. 39, Forest Street, I fail to see.

Witness further stated, in reply to the TOWN CLERK, that Rawlinson had entered into no obligation to take gas from the Corporation.

The TOWN CLERK: Then up to that time the complainant had been using Corporation gas without giving them any intimation that he was doing so.

Mr. NOWELL (to witness): What month was this entered into the Corporation books?

Witness: I am not prepared to say; and I do not know by whom.

Mr. HANDSLEY: Thus you see you have no clear evidence on this point, for you have nothing to say about it.

The TOWN CLERK: This is not my witness. I did not know he was here. He has been brought here by the complainant.

Mr. HANDSLEY: The Act of Parliament says you shall simply ask a consumer for security, and if he fails to give it you shall refuse to supply him with gas. But the gas-works are erected for the benefit of the whole of the inhabitants.

The TOWN CLERK: Yes, but do you see section 255, sub-section 1?

Mr. HANDSLEY (reading): If any person who is supplied with gas or water fails to pay any gas or water rent due from him, or give, when demanded, such security, the Corporation may, notwithstanding any existing contract, cut off the supply. Very well. But here the man has paid, or if he has not paid in full he has been released by law, which is the same thing.

The TOWN CLERK: That is so, so far as any legal liability to recover is concerned.

Mr. HANDSLEY: You are only entitled to cut off the gas in case there is a debt legally due to you which a consumer is bound to pay. But this is not legally due, as he has gone through the County Court and got his discharge.

The TOWN CLERK: We cut the gas off when the account was not paid before the bankruptcy, and this was the first time we had any knowledge that complainant had again been using gas.

Some argument here took place whether the phrase "may supply" should be taken as meaning "shall supply," the TOWN CLERK reading several sections to show that it should mean "may," inasmuch as the word "shall" was employed in cases where the imperative mode was used.

Mr. HANDSLEY: But how does that question arise in this case? Here is the fact that they do not supply the gas.

The TOWN CLERK: But I will prove that complainant took it without our knowledge, and that when it came to our knowledge we cut the supply off, and sent him in a bill for what he had consumed.

Mr. NOWELL pointed out that though the 197th section said that the Corporation "may supply gas," yet when it was considered in connection with the larger section just read, it was evidently the intention of the Legislature to look upon it as the compulsory sense; so that when he came to read the two sections together he arrived at the conclusion that the first "may" meant "shall."

The TOWN CLERK: There is a great distinction in the section relating to water, for it says the Corporation "shall" supply it for domestic purposes, but for "may" as to manufacturing purposes.

Complainant was then called, and said he removed from No. 39, Forest Street to 8, Canning Street, on the 23rd of August last. His aunt, Agnes Tasker, was the tenant of 39, Forest Street, and witness purchased the furniture from her a few days before he removed to Canning Street. While removing, he took a supply of gas from Agnes Howarth, who was assisting him, to go and ask the men to come and read the state of the meter. At the time he paid the demand note on Nov. 24, he saw Mr. King, the Borough Accountant, in his private office, and asked him why the gas supply had been discontinued. Mr. King replied, "Because the old account was not paid belonging to Mount Flaming Mill and the house in Nelson Square." This was done prior to the filing of his petition, which was done on the 27th of November, 1878, previously to which he had been a mill manager, and had contemplated carrying on the business of a cotton spinner and manufacturer. At the time his gas was cut off in Nelson Square he met Mr. King in Manchester Road, and asked him on what condition he could get his supply of gas again. Mr. King replied, "You cannot have any gas from the Corporation until you have paid for what you have consumed," and added that he had direct instructions from the Gas Committee not to give a fresh supply of gas to any one who was in arrears. On the 24th of November last, when witness went to ask about the discontinuance of his supply of gas, he took with him his old deposit note, and told Mr. King that he considered he had forfeited it under his liquidation arrangement, and he also said that he was prepared to pay a further deposit of 5s. or 10s., or any other reasonable sum. Mr. King replied that he could not give him a further supply of gas until the two months' arrears had been paid, amounting to £4 7s. 6d., but the balance of which was £5 18s. 3d., were paid.

Cross-examined by the TOWN CLERK, witness said he offered to pay 8s. in the pound, but his creditors would not accept it, and the trustee only paid 1s. in the pound. When he removed, he did not send any intimation to the Corporation that he wished to be supplied with gas. He simply said he was leaving Forest Street and removing to No. 8, Canning Street.

Mr. HANDSLEY: I think you must take that as being equivalent to an indirect intimation that he intended to use gas.

The TOWN CLERK: We simply ascertained on Oct. 26 that he was there and consuming gas, and we made out the bill from the state of the meter when the previous tenant left, to the state in which the inspector then found it.

Mr. HANDSLEY (to the TOWN CLERK): I think Mr. Knowles has at any rate established a case that you must answer. It is not most important case.

The TOWN CLERK: Yes, I have. You have a similar case in King's reply.

The TOWN CLERK then addressed the Bench, and said the Gas Committee, as they assumed, had power which enabled them to refuse the supply of gas to any one who failed to pay. In this instance there were arrears amounting to nearly £4. It was true that the complainant had filed a petition in the County Court, but that did not prevent the Corporation from refusing to supply him with gas, but nevertheless the above-named amount was still due to the Corporation, and it was a penalty imposed upon a defaulter for not discharging his accounts—that he could not have the privileges possessed by other burgesses so long as he was a defaulter, although, because of his having taken proceedings in liquidation, the Corporation were not able to recover the amount.

Mr. KNOWLES: I think there is a statute giving credit.

The TOWN CLERK: Yes, I know there is; but under this particular section, with all due deference, I submit that the Magistrates have no jurisdiction upon the facts put before them. The section, stripped of unnecessary words, reads that the Corporation shall be liable to a penalty, not exceeding £5, if it shall discontinue the supply of gas to any person, then having a supply, for want of security, unless such person has failed to give us security within seven days, which we could ask for. I do not say in this case that we have asked, but we might have done so. If persons come to me and request to be supplied with gas, and we say, "Very well, we will supply you, but you must give security," that makes a contract, and if they cannot agree as to the terms of the security, the Magistrates are called in as arbitrators to say what security shall be given.

Mr. NOWELL: But supposing a person applied to you for gas, and that you had no reason or other for refusing to supply him, and refrained from taking for his security, do you say that under the section you would not be liable?

The TOWN CLERK: No, not before the Justices. It would be a question then for a civil action. The only jurisdiction of the Magistrates is to arbitrate and say what the amount of security shall be.

Mr. HANDSLEY: I am quite clear there is nothing due to the Corporation, and that nothing can justify the Corporation in treating people in this way.

Mr. HASLAM said the question presented itself to his mind in this way: Had the Corporation any advantage over other creditors?

The TOWN CLERK: It has no advantage in recovering money. But supposing you had a man down in your books as owing you a certain amount, you are not bound to supply him again.

Mr. HASLAM: No, certainly not.

The TOWN CLERK: I tell it is just the same here. If a man gets a debt on to the County Court, the County Court gives us power to refuse to supply him further until he pays our account in full.

Mr. KNOWLES: You are not trustees for the public benefit.

The TOWN CLERK: Yes, we are.

The Magistrates then held a consultation, at the close of which

The TOWN CLERK: This question is both a difficult and important one, and Mr. Haslam and I will take a week to consider our decision; and in the meantime Mr. Nowell will consider the question, and look up cases.

Miscellaneous News.

A REVIEW OF THE MANUFACTURING OPERATIONS OF THE PARIS GAS COMPANY IN 1870 AND 1880.

The following is the report of the Commission nominated by the French Minister of the Interior, early in the present year, under the circumstances and with the objects referred to in the article on "The Gas Supply of Paris," which appeared in the last number of the JOURNAL.

In the present report the Commission purpose following, step by step, the processes employed by the Paris Gas Company in the manufacture of illuminating gas, from the delivery of the coal into the Company's premises, down to the passage of the manufactured gas through the out-valves into the mains for distribution. In doing so, it will be convenient to divide the entire process into five stages, viz.: (1) the distillation of the coal; (2) the condensation of the tar, tars, &c.; (3) the chemical purification of the gas; (4) its storage; and (5) the treatment of the residual products—coke, tar, and ammoniacal liquor.

I. Distillation of the Coal.

Of the several operations comprised in the manufacture of gas, the distillation of the coal is assuredly the most important, as it is upon the results obtained by distillation that the principal return depends. This work the Paris Gas Company have succeeded in making more profitable than it formerly was, and the results have been perfect, a theorem have had an important influence on the quantity of gas obtained from the coal put into the retorts. In order to ascertain exactly the extent of this influence, the Commission applied to the Managing Director of the Company to be furnished with the official returns showing the quantity of gas produced during the past 15 years from each hundredweight of coal carbonized, and the following figures were supplied:

Year.	Gas Made.	
	Per 100 Kilos.	Per Ton of
	Cub. Mètres.	Cubic Feet.
1863	25-56	10,092
1866	25-05	10,235
1869	25-37	10,267
1870	25-53	10,424
1871	25-87	10,150
1872	25-83	10,177
1873	25-77	10,156
1874	25-10	9,920
1875	25-10	10,272
1876	25-18	10,283
1877	25-98	10,588
1878	25-59	10,596
1879	25-70	10,681

These figures show that the yield of gas, which before the year 1861 rarely exceeded 27 or 28 cubic metres per 100 kilos. of coal (about 8500 to 9000 cubic feet per ton) has gradually increased to 30-20 cubic metres (about 10,600 cubic feet per ton). This shows an increased yield of very nearly 2 cubic metres, or about 7 per cent. per 100 kilos. of coal carbonized. Here is evidently an important fact; but should be remarked, on the one hand, that it was long before the year 1870 that the improvement began to show itself; on the other hand, that it is simply to skilful manipulation, and not to the introduction of any processes foreign to the system of manufacture employed in 1870, that this increased yield of gas is to be attributed. In fact, several causes have combined to bring about this result. The retorts have been manufactured with greater care; double and treble cylinder combined exhausters, working regularly and at trifling expense, have not since 1870 merely, but for more than 20 years past, gradually replaced those by Paulweils; more carefully selected coals, obtained from Belgium, the north of France, and elsewhere, have been selected and from them an admixture of raw material has resulted a more regular and more abundant production of gas than that hitherto yielded by single varieties of coal, or even by mixtures thereof less carefully made. However, the influence of these causes has really been only a secondary one; it is in the exact determination of the temperature of the retorts, the distillation of coal, and in obtaining the utmost duty from the retorts after they have been brought up to this temperature, that must be sought the chief cause of the improved yield of gas to which allusion has just been made.

Some 15 or 18 years ago, gas makers began to substitute, for the comparatively low temperatures previously employed in distillation, the temperature of about 1200° C. (2200° Fahr.), by which a considerably larger yield of gas is effected, it was at once found to be necessary to draw off as quickly as possible the gas produced at this high temperature, and in order to do so the method adopted was to allow in the retort only the space actually required for the expansion of the coke. It was thus that the Company were gradually led to increase the charge of each retort, which formerly rarely exceeded 60 kilos. (132 lbs.), to 78 kilos. (172 lbs.) in 1861, to 90 kilos. (196 lbs.) in 1863, to 108 kilos. (238 lbs.) in 1866, and to 127 kilos. (280 lbs.) in 1869, and the temperature of the retorts increased at which it now stands—viz., 130 kilos. (286 lbs.). It is in this way that the Company have succeeded in obtaining their high yields of gas, which since 1870 have risen to 25-53 cubic metres per 100 kilos. of coal carbonized (about 10,425 cubic feet per ton), and have only fluctuated to a very slight degree above or below this figure, such fluctuations being due to all cases attributable to variations in the character of the coal employed.

In none of the foregoing details of carbonization it is possible to recognize any process foreign to the system of manufacture previously employed by the Company. It is simply to more skilful manipulation, and not to any new arrangement or any new apparatus, whether it be in the processes, that is to be attributed the increased yield of gas which the Commission found had been obtained. But even if this were otherwise, the period at which these improved methods of carbonization were adopted—viz., 1862-64—would at once and entirely exclude them from consideration in the present report.

However, this more skilful manipulation does not alone represent all the improvement of which the method pursued in the distillation of coal is actually susceptible, and it is desirable also to examine to what extent the improved results shown have been influenced by the employment by the Company, at several of their stations, of the Siemens regenerator furnaces. The adoption of these furnaces in certain industrial operations where great heat is required, has resulted in a saving of from 40 to 50 per cent. in the cost of fuel. Has this been the case with gas manufacture? Here is a point the consideration of which is of so much more importance, inasmuch as the adoption of these furnaces, whether it be in the year 1870, or whether it were at the present time imposed upon the Company, might most assuredly be regarded as the introduction of a process such as Article 48 of the Company's concession has been understood to provide for. On the one hand, the economy of combustible which the use of the Siemens furnaces in glass-making, &c., has effected, is a process which makes possible of realization, is very considerably reduced in the face of the lower temperature suitable for the manufacture of gas, and is

moreover largely counterbalanced by the increased expense of first establishment necessitated by their employment; on the other hand, it was at a period considerably anterior to 1870—namely, in 1863, that the Company constructed at their Vaugrard station the first four Siemens furnaces set up in France for the manufacture of gas. These two points are clearly established in a report presented to the Board of Direction of the Company on the 26th of January, 1867, by the present Managing Director, M. Camus. An authentic copy of this report has been submitted to the Commission, and it shows that the economy in fuel realized by the employment of the Siemens regenerator furnaces in the manufacture of illuminating gas, far from reaching, as in the case of certain industries in which very high heats are required, 40 or 50 per cent., never exceeds 20, and frequently falls to 17 or 18 per cent.; also that the economy of fuel thus realized is not to be taken as the first or only source of the increased expense necessitated by the special mode of constructing the retort-houses and building the ovens to which the regenerative system of heating could be usefully applied, and notably the double-stage houses. In fact, on the one hand, the economy of fuel due to the employment of the Siemens furnaces is represented by a sum of only 76 frs. 50 c. (43 ls. 3d.) per annum, while the cost of setting, which for an ordinary retort-house represents a sum of 1293 frs. 72 c. (£50 11s.), a double-stage house with the Siemens furnaces is increased to 2005 frs. 70 c. (410s. 5s.); whence arises, to the disadvantage of retort-settings of this kind, a difference in the first cost of not less than 1841 frs. 98 c. (£58 15s.), the interest on which at 6 per cent. would come to 80 frs. 51 c. (43 s. 6d.)—a greater amount than that realized by the economy effected in fuel. It has also been observed that since the time when the Siemens furnaces were tried for the first time by the Company—viz., in 1863—their employment has been limited to certain special cases, and that the original stations, and notably those at St. Mandé and Vaugrard, are provided with these furnaces, in the one case to the extent of half, in the other to the extent of one-third of the entire number of settings; while among the new or more recently constructed works, in those at Ivry and at Cligny only—the latter not having yet been brought into operation—any retort-house has been adopted. It was owing to the exceptional position of each of the above stations, as well as to the necessity of guarding against certain special inconveniences, that the Company were led to adopt the Siemens furnaces. At Vaugrard and at St. Mandé the construction of double-tier ovens, the cooling by the lower tier of the upper, and the consequent saving of increased outlay for combustible necessitated by such cooling, compelled the Company to seek, by the employment of the regenerative system, some compensation for the disadvantageous conditions under which they were working. At Ivry and at Cligny, the necessity of excavating the soil beneath the retort-houses for the foundations of the retorts, led the Company to substitute regenerator furnaces for massive foundations, as the former, by the economy of fuel they would effect, would compensate for the extra expense rendered necessary by the nature of the ground.

Beyond, however, the special cases above reported, the Company have been contented of gradually applying the Siemens furnaces to their retort-settings, and in the large works at La Villette, as well as in those at Passy, Les Ternes, St. Denis, Boulogne, and other places, they continue to heat the retorts by the ordinary methods. In the partial employment by the Company of these furnaces the Commission fail to discern one of the processes contemplated by the 48th article of the concession. This may be considered as a system foreign to the original process of gas-making; but, on the one hand, its adoption took place anterior to the year 1870, it being in 1863 that the Company for the first time commenced working the regenerative system in their works at Vaugrard; and, on the other, its employment is not calculated to effect any very notable diminution in the net cost of gas.

II. Condensation.

The processes adopted by the Company for the condensation of those residual products of gas manufacture which are liquefiable by simple cooling, and particularly the tars, have not undergone any very important change since the year 1870, the Company having been contented to pass through a long series of pipes, sometimes horizontal, and sometimes, and preferably, vertical, that the condensation of the greater part of the tarry matters and a certain portion of the ammoniacal liquor is effected.

To this mode of proceeding, however, was added, in 1874, an improvement of such character that it can only be regarded as a modification of part of the system of manufacture followed in 1870, but, on the contrary, must be regarded as a new process. The improvement referred to is that effected by MM. Pelouze and Audouin by means of their condenser. On leaving the series of pipes through which the gas had passed in the process of condensation, it was found to carry with it a considerable quantity of water to which it had been subjected, a certain proportion of tarry matters, and notably the light hydrocarbons, which in due course came into contact with the purifying materials, clogging them up, and thus rendering their action less efficacious; besides this, on these impurities becoming mixed up with the purifying materials they could not be extracted, and this resulted in a loss to the Company. In order to effect the separation of these tarry matters, MM. Pelouze and Audouin conceived the very ingenious notion of compelling the gas, after it left the pipe condensers, to pass through a suspended vessel, the sides of which, formed of two concentric plates of iron, are separated from each other by a distance of 5 or 6 millimetres (0-20 inch). The space between these plates is pierced with a number of holes 1-5 millimetre (0-6 inch) in diameter, through which the gas passes, and being impelled forward by its own velocity, strikes the second plate, which presents a plain surface opposite each of the holes in the first plate, and the system of attenuation first and struck by the water, the tarry matters suspended in the gas in the form of thick smoke unite to form a liquid, which trickles down the sides of the vessel, and flows into the bottom of the condenser.

Adopted by the Company, and now installed in nearly all their works, this manner of separating the tarry matters from the gas has been found to be very much larger quantity of tar than they had previously done as well as to effect an easier and more complete purification of the gas. It is therefore right to inquire what influence, if any, the adoption of this appliance has had upon the cost price of gas, and whether any notable reduction has been effected. The employment by the Company of the Pelouze and Audouin condenser has, in fact, had but very slight effect upon their general working expenses, and the saving effected thereby has been quite insignificant. In fact, from some particulars furnished by the Company to the Commission, it appears that the annual benefit derived from the employment of this condenser in 1879, the Company's first year of its employment, included, amount to about 51,000 frs. (£2040). This amount, spread over a production of 320 million cubic metres (7760 million cubic feet) of gas, represents only 0-023 c. per cubic metre (or about 0-06d. per 1000 cubic feet). The reduction of the cost price of gas resulting from the adoption of this condenser since its use cannot, under any circumstances, be regarded as of very great importance.

III. Purification.

The methods employed by the Company for the chemical purification of their gas—that is to say, for the elimination of the sulphuretted hydrogen and the volatile ammoniacal salt it contains—are at the present

time exactly the same as they were of old. The process is still that of compelling the gas to pass through layers of sawdust, of varying degrees of thickness, saturated with sulphate of lime and oxide of iron.

Certain improvements in detail have been effected in the purifying operations, such as placing in front of each of the sets of purifiers an extra vessel containing only moistened sawdust, intended to extract a considerable portion of the ammoniacal salts, and thereby enabling the purifying material in the succeeding vessels to act more efficaciously. These improvements in detail have not, however, been considered by the Commission to be of sufficient importance to merit special attention. Not only so, but the facilities possessed by the system of the American Cyanide Co. for the employment of the Company, but cannot, strictly speaking, be called processes at all. Furthermore, their effect on the net cost of the gas is absolutely nil.

IV. *Storage.*

The construction of gasholders, whether single-lift or telescopic, has not of late years been aided by any new systems. It is only in dimensions, which the Company have in one case increased to 30,000 cubic metres (1,060,000 cubic feet), that the present holders differ from those constructed prior to the year 1870. The general employment of Pauwels's articulated inlet and outlet pipes, and the adoption of tangential guide-rollers, which ensure more regularity in the rise and fall of the holder, are facts now so generally known that they need scarcely be considered as novelties. The process of foreign to the native manufacturer followed by the Company in 1870, and are in no case of such a nature as to exercise any influence in the way of reducing, to any appreciable degree, the net cost of the gas.

V. Treatment of Residuals.

Of the several branches of the gas industry carried on by the Company, the one which most arrested the attention of the Commission was that which has for its object the treatment of the residual products. Of these products there are three, viz., coke, tar, and ammoniacal liquor. Of these three, two of these residual products have in the last few years been subjected to some very important modifications by the Company; but no change has been effected in the treatment of their ammoniacal liquor. One of these improvements has been the use of benzene for the treatment of the coke and tar, the results have been very apparent; and though these benefits have been considerably exaggerated, they are such that the Commission considered they ought to inquire into the causes of the nature of these contemplated by Article 48 of the concession.

gained by Article 18 or the concession. The Company's profits have been subjected to during the period under consideration, the profit derived from the treatment of the coke and tar may be considered as representing at the present time nearly 0.5 c. per cubic metre (about 1.4d. per 1000 cubic feet) of coke, and 1.5 c. per cubic metre (about 4.2d. per 1000 cubic feet) of residual products during the past ten years; the figures also show that the value of these products, which in 1869 amounted to 7.47 c. per cubic metre (about 18.5d. per 1000 cubic feet) of gas, increased progressively to 10.5 c. per cubic metre (about 26.2d. per 1000 cubic feet) of gas at the present time it gradually dropped to 7.86 c. per cubic metre (19.14d. per 1000 cubic feet). It is to the improvements introduced by the Company in the production of coke and tar that the increase in the value of these products is shown by these figures is attributable.

Recognizing these improvements, it became a question for the Commission to consider whether, although they were the outcome of the adoption of new processes foreign to the system of manufacture pursued anterior to 1870, they ought to be considered as falling within the scope of Article 48 of the Company's concession. The Commission are of opinion that they do, and that the Company are entitled to the benefit of the improvements, as no part of gas manufacture, properly speaking; that it is simply an industry closely connected with the production of gas; and that if, by the terms of their concession, the Company are obliged to divide with the City the profits resulting from this subsidiary branch of their operations, they are equally obliged to consider the case of any processes to which they consider they ought to have recourse.

A few reflections will suffice to prove that this could not possibly be otherwise. On the one hand the coke, on the other the several products resulting from the treatment of the tars, are articles of commerce which have a variable market value. They are subject to the law of supply and demand, and their price is determined by the competition of the market. Illuminating gas is always offered to consumers at the unvarying price assigned to it in the concession. Therefore if it were pretended that whenever the selling price of these residual products ruled high, there should, as a consequence of the extra profit made, be a reduction in the price of gas, strict equity would render inevitable a corresponding increase in the price of gas, should the market be inclined to lose the special value which had made them a source of profit.

Without discussing this question at any length, one consideration will alone be sufficient to establish the fact that the treatment of the residuals products of gas manufacture cannot be classed among the operations of the gas companies. The fact that the gas companies are not permitted to do anything to compel the Company to work up their residuals themselves, and instead of treating them upon their own works, they are at liberty to dispose of them as they see fit, is a strong indication that they are not their own body. In this case, without having to trouble themselves about the terms of Article 48, they would be able to profit by the increased value which might have been ensured to these products by a more or less active competition. It should be observed that the same is not the case with those here indicated in no way gratuitous, and in England especially, the whole of the gas companies, with some few exceptions, pursue this

In dwelling upon these considerations, the Commission have been led to think that the treatment of residuals constitutes, in the works of the Paris Gas Company, a branch of industry perfectly independent of the principal one, and that consequently Article 48 of the concession cannot be regarded as applicable to the processes employed in carrying it on.

be regular, and to substitute to the processes employed by the Commission. The Commission, however, after consideration the possibility of their opinion on this part of the question not being accepted, and to ascertain whether, in the operations connected with the treatment of residuals, any new processes were to be met with, and whether the adoption of these processes was capable of effecting any definite reduction in the cost of production. In this connection the Commission considered, among other things, the subject of the treatment of ammoniacal liquors and the manufacture of the chemical products resulting therefrom, as into this branch of the Company's operations no modification had been introduced. The treatment of coke, however, could not fail to arrest their attention. In fact, by improving the coke breakers and screening appliances used, so that the coke was broken into smaller pieces, and, in the first place, been enabled to give to this combustible, which in former times was principally sold abroad, a character and appearance such as to cause Parisians to seek it eagerly. When the Company found themselves encumbered with large quantities of breeze, caused by the breaking of the coke, they then compressed it with the pitch remaining after the distillation of the tar, and obtained a solid combustible material which could be employed in heating the retorts. Examined

with care, these modifications did not appear to the Commission to merit, on any single point, the appellation of new processes; and even had it been otherwise, they could not in any case be considered as having contributed to a reduction in the cost price of gas. From some official figures communicated to the Commission, they find that the produce of the sale of 100 cubic feet of gas made, represents at present only 5·9 c. per cubic metre (1s. 4½d. per 1000 cubic feet). In short, the modifications in the treatment of coke with which reference has just been made have resulted, not in the reduction of the cost price of gas, but in preventing the price from rising to the extent of the difficulties experienced in disposing of the coke in its crude state.

The treatment of the tar has produced different results and to make their importance appreciated it will be sufficient to remark that in 1869 the sale of the various products obtained from tar represented 0.78 c. per cubic metre (2.2d. per 1000 cubic feet) of gas made, while in 1879 it represented 1.3 c. per cubic metre (3.9d. per 1000 cubic feet), and in 1890 it represented 1.6 c. per cubic metre (4.5d. per 1000 cubic feet) in favour of the present position. It is in the extraction of anthracene and in the daily increasing employment of the heavy oils for creosoting timber, that the cause of this enhanced value must be sought. It is not, therefore, to be attributed to the employment of any new manufacturing process. As the anthracene, which was formerly known as "black wax," and the carburet not being employed, it was abandoned among the residual products. A scientific discovery was made which revealed in the anthracene the starting-point of one of the most remarkable transformations that has been realised by modern chemistry—a transformation which has been effected by the action of sulphuric acid on the anthracene, artificial alizarine; and the intelligent manufacturer immediately set about obtaining from the residual products of the distillation of coal, the hydrocarburet which had suddenly acquired an unexpected value. But in order to obtain it he has not been compelled to employ any really new process; he has only been obliged to employ a process which has been known at an increased expense, the products derived from the distillation of the tar.

expenses, the products derived from said concession, which the British Gas Company extract from their tarpossses, in truth, a considerable value; but this value is extremely variable, and the price has been known to rise to 11 frs. 86 c. (5s. 6d.), in 1875, and fall to 4 frs. 76 c. (3s. 10d.) in 1878, then rise again, in 1879, to 7 frs. 6 c. (5s. 8d.). These variations in price are such that it would be impossible, as has already been pointed out, to base upon the sale of the products of the concession a fixed price, in contradistinction to the opinion of the Commission, the treatment of residual products had been specially contemplated by Article 48 of the concession.

CONCLUSIONS.

It follows, from the foregoing observations, that if the system of gas manufacture followed by the Paris Gas Company in 1870 is contrasted with that employed by them in 1880, the following conclusions will be arrived at:—

1. That with regard to the distillation of coal the Company have effected some important improvements, but that such improvements are due to more skillful manipulation, and not to any manufacturing process foreign to those in use in 1870.
2. That in consequence of the adoption of the Pelouze and Audouin condenser the Company have effected, by a new process, an increase of production corresponding to a reduction of 0.023 p. per cubic metre of gas made—a reduction which cannot be considered as of very great importance.
3. That the purification and storage of gas is carried on in the same way as hitherto.
4. That the treatment of the residual products cannot be considered as a separate branch of the operations understood to be contemplated by Article 48 of the Company's concession; that the operations comprised in such treatment are not, strictly speaking, connected with gas manufacture as understood by the terms of that concession, but form altogether a separate branch of manufacture. Hence, regarded in the light of the terms of Article 48, there is no ground for passing into the hands of the concessionaire the improvements in this direction, inasmuch as such improvements do not result from the adoption of new processes.

While, therefore, the Commission fully recognizes the desirability of effecting a considerable reduction in the price of the gas supplied to the inhabitants of Paris, they find themselves led to this conclusion: That the application of Article 48 of the treaty entered into between the City and the Gas Company presents no element upon which this reduction could be based, since in the system pursued by the Company in 1880 for the manufacture of gas there is not found to be any new process, or anything foreign to the system employed in 1870, which might be of such a nature as to effect a considerable reduction in the net price of this product.

RAND JUNCTION WATER-WORKS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held on Wednesday, the 15th inst., when the report of the Directors stated, in reference to the half-yearly statement of accounts submitted, that it would be perceived the "Directors have not been over-sanguine in their anticipation of an early return to that financial prosperity which in former years represented the normal condition" of the Company's affairs. The report continued:

Many causes—arising partly from renewals and remodelling of works, from exceptional accidents, from heavy parliamentary expenses, from inclemency of seasons, from commercial depression, but mainly from the expenditure, within the last two years, of a sum of £100,000 in the purchase of the waterworks, and the consequent increase of the efficiency and purification of the water supply, which your Directors determined, at whatever sacrifice of pecuniary gain, to carry out—have no doubt tended to retard the evidences of this prosperity, but they have not prevented the Company from making a large profit, and from obtaining a large remuneration for the sale and purchase of the undertaking. The Government agent was distinctly informed, that in calculating the selling value of your works and property on the figures of the last year, he was purchasing the concern under the same conditions as the Shareholders.

circumstances disadvantageous to the shareholders.

For the year ending Michaelmas, 1879, the increase of the Company's revenue was £3686. For the year from Michaelmas, 1879, to Michaelmas, 1880, the increase is now shown to be £10,074. There is one point material to be noted in connection with the increase of the Company's revenue. The Board then agreed to as representing the Company's annual increase of profit was £2350, whereas the increase for the last financial year ending Michaelmas, 1880, has amounted to £7555, and as the Board have no doubt that the Company's revenue will continue to increase, there is no reason why the Company's profits should not continue in the future at something like that amount. Nor has this state of things arisen from any avoidance of expenditure in the proper management of the works. Your Committee's establishments at the several stations are in excellent order and efficient working condition. The new works in progress at the Hampton station—namely, the three filter-beds and the covered reservoir, are now almost completed. The additional works which your Directors contemplated in connection with these filter-beds—namely, the erection of a pair of pumping-engines, so as to replace the separate system of supply for the country district, and, in connection with the covered reservoir, the erection during the year ending Michaelmas, 1881, of a pair of pumping-engines, will now be at once proceeded with.

In order to meet the desire that has been expressed in public quarters for constant

THE CHAIRMAN said he had been appointed by Vice-Chancellor Hall to act as Chairman of the present meeting, and report to him the result of the several resolutions which would be proposed that day. They would remember that at a meeting held in July last he advised some arrangement of the Company's affairs, by which they could be more efficiently carried out, and more equitably adjusted. That that arrangement had been formed, and that a scheme had been adopted, and this day, being in detail, to the effect of the general suggestions he had thrown out, the principal variation being the substitution of 7½ for 6 per cent. interest, and a share of the profits. The question for them to consider was, whether they would now give their approval to the scheme or not, and he might add that he had already asked the Solicitors to be present, and they had agreed carrying out the arrangement amongst themselves, but were advised by their legally constituted Solicitors that it could not be carried out except with the cognizance of the Court of Chancery, which would give a more binding effect to their proceedings. A debenture-holder having presented a petition for liquidation, they would have to order the liquidator to be appointed for liquidation, they would have to reorganize the Company, and the reorganization completed. With regard to Inniss and the Company, the Courts there would take cognizance of any question that might arise between the public and the Company as to the supply of water, and simply record the action of any of our Court Committees. This, he thought, was a matter for consideration, and he would now read the resolutions proposed from the Council of the St. Petersburg Waterworks, there was no doubt about him sending the money in

due course, and therefore there would be no delay except what might arise through the Court of Chancery. He believed the scheme would be equally advantageous to both Debenture-holders and Shareholders, and concluded by recommending them to adopt a resolution to that effect.

Mr. R. S. GUINNESS seconded the motion, which was carried unanimously.

A meeting of Shareholders was then held, to whom the CHAIRMAN detailed as before the circumstances under which the meeting was held, and concluded by moving the adoption of the scheme.

Mr. GUINNESS again seconded the motion.
The STATIONMASTER asked what prospect the Chairman could hold out as to the Shareholders being able to touch any money. He thought if they were to go on year after year until the "Greek Kalends," it would be better to know the worst of it, and wind up the affairs of the Company.

Mr. SACRETTA said to talk of winding up a Company like theirs was ridiculous and suicidal. They had their works at St. Petersburg in first class order, and a number of hospitals, barracks, &c., were coming to them for water, and there was a considerable increase of private consumers. He then went into figures to show that should their present prospects hold good there might be a dividend in two or three years. At all events it would be madness for them to propose the Company as by vote, and at the same time there would be nothing either for Debenture-holders or Shareholders.

After some further discussion, the motion for the adoption of the scheme was again carried unanimously, and the proceedings terminated.

NEWPORT (MON.) WATER-WORKS COMPANY.

A Special Meeting of this Company was held on Wednesday, the 15th inst., for the purpose of deciding as to the proposed increase of capital and extension of works.

The CHAIRMAN (Mr. S. Homfray) having briefly stated the object of the meeting, moved the adoption of the following resolution—"That the application to the Board of Trade for a Provisional Order, to be confirmed by Parliament, authorizing this Company to raise additional capital for the general purposes of their undertaking, is hereby assented to and approved of by the Shareholders and Proprietors of this Company."

The VICE-CHAIRMAN (Mr. J. W. Jones) having taken the Chair, the Chairman to state the position of affairs, said after careful consideration of the probable increase in the population of the district, and the consequent greater demands that might be expected upon the water supply, the Directors had decided that it was essential that they should effect such an extension of the works as would enable them to meet the demand in accordance with the estimate of their Engineer (Mr. Taylor), £35,000 would be required for the construction of a bye-wash at the upper reservoir, to prevent flood water getting into it; £20,000 for a new subsiding and storage reservoir and works connected with it at Tynsbro, which would be of great import to meet any increased demands upon the water supply for 20 million gallons of water, and enable them in times of heavy floods to receive the water into the subsiding-pond, so that it could be introduced into the town in a pure state. The next important work was the deepening of the lower reservoir, which was very shallow at one end, and the deepening and re-surfacing of the same at £14,000. For alterations at St. Woollos tank, where they propose to build two workmen's cottages, £1000 would be required; and it would cost £500 to convert the old engine-house into offices and board-room. The covering over of the reservoir was estimated at £3000, and other contemplated works, the chief of which was the deepening of the service-pipe to meet the demand at £39,250. The total amount of the estimate (allowing 10 per cent. for contingencies) was £94,875, and the Directors proposed to obtain from the Board of Trade powers for raising a further capital of £100,000, of which £80,000 would be in shares, the remaining £20,000 to be borrowed. Thus prepared, they hoped to be in a position to meet any increased demands upon the water supply which might reasonably be expected. It was indispensable to the interests of the Company that the scheme should be gone on with, and he hoped the Shareholders would rely upon it that the Directors would study their interests in the future as they had done in the past. The Directors were anxious to increase the rate of the water supply, and to keep the dividends of the Shareholders up to the maximum of 8 per cent.

Mr. T. GRATEBY, in seconding the adoption of the resolution, said he felt convinced that the scheme would prove beneficial to the Company.

The CHAIRMAN observed that very likely not half the amount of new capital asked for would be required.

Colonel LYNE expressed a desire to be informed as to the probable requirements of the next few years, and as to how it was proposed to allot the shares.

The VICE-CHAIRMAN replied that it was estimated they would require to take £24,000 or £35,000 of new stock, and to divide it into one, two, or half or two and a half years. As to the shares forming the new capital, it was the intention of the Directors to allot them *pro rata* to the Proprietors. He was happy to say at the present moment the improvement in the rents was tolerably satisfactory, and enabled the Board to look forward with some confidence being able to continue to pay a dividend of 8 per cent., though he was not prepared to say that there might not be a year or so during which they might not be able to quite make it up.

The resolution was then put to the meeting, and adopted unanimously, and the proceedings were brought to a close.

RECENT EXTENSIONS AND ALTERATIONS AT THE SALFORD CORPORATION GAS-WORKS.

In an article, in the *Salford Weekly News*, on "Public Improvements in Salford during the year 1880," one contemporary remarks that in the year which is just closing the Corporation of Salford have been busy carrying out many important works for the improvement of the borough. No new undertakings have been commenced, but much has been done towards completing schemes which were formed in years gone by. The alterations then proposed were:

Perhaps the most extensive and costly improvements that have been made in the borough during the past few years have been in connection with the gas-works. It will be remembered that some three years ago—in 1877—Mr. Samuel Hunter, the Gas Engineer, laid before the Committee an estimate, with showed that the works at Lamb Lane, Liverpool Street, and Regent Road could be placed in an eminently satisfactory condition, and made equal, perhaps, to any in the country, for an outlay of £160,000. The estimate was accepted by the Council, and the work was at once proceeded with. After three years the works are nearing completion, and it is found that the £160,000 was a most accurate estimate, for the extensions that are now in hand or have been finished have cost £126,000, and the remaining £34,000 will just about cover the expense of all the other improvements that can possibly be required.

The alterations that have been made at the Lamb Lane works comprise the pulling down of the old offices and the erection of new ones, the erection of additional store-rooms, workshops, and governor-house, the re-modelling of the engine, exhaustor, and boiler house, and additions to the purifying apparatus. On these works some £5800 will be spent. The new offices consist of a three-storied building in the plain Gothic style of

architecture. The main entrance is surmounted by a tower, and on either side there are spacious rooms for the accommodation of the persons connected with the gas department. On the left-hand side of the entrance is a fine room in which the indoor clerks will be engaged, and the Indoor Superintendent will also have a small office here. On the other side is the outdoor clerks, the Outdoor Superintendent, and the meter inspectors will be provided for. At present some of these have offices at the Salford Town Hall. On the upper floor the Gas Engineer will have his office, and there will also be a room for the clerks, a room for the meter inspectors, and various other offices. The cellars will be utilized as store-rooms, dining-rooms for the workpeople, and for other purposes. To the left of this building are the newly-erected stores, where will be kept the various implements required in the manufacture of gas. The largest part of the buildings, however, will be used for the meter repair, and storage of gas-meters. The timekeeper will also have his office here. In the new engine and exhaustor house, which are at the back of these offices, there are two fine boilers that are alternately used to drive a horizontal engine which is in adjoining premises, and which works the exhaustors that are also in the room. All these new, and are made upon the best modern principles. Preparations are now being made for the reception of a second horizontal engine, so that should the first get out of order no inconvenience may be felt. The only other new apparatus that has been supplied to this station is one of Kirkham, Hulett, and Chandler's patent water-scrubbers. All the old apparatus, however, has been put in thorough working order, the works having been stopped for some three months to admit of this being done.

At the Regent Road (No. 2) station there has been an almost entire remodeling of the works, and very large extensions have been made, embracing new engines, new gas-meters, new gas-holders, new gas-works, and a governor-house, all of which have cost about £41,000. The whole of these improvements have not been carried out during the last year, however. Since last Christmas one of the old retort-houses has been enlarged and fitted up with 234 retorts, 20-inch by 16-inch. The capacity of this is 68 feet in diameter, and the capacity of the whole about £12,000. All the retorts are now in working order, but only a few of them have yet been used. In connection with this retort-house a new chimney, 170 feet high and 14 feet square at the bottom, has been erected. The only other extension of this station which has been made during the last year is the building of a large brick tank for an ammonia-water tank, 45 feet long, 25 feet wide, and 25 feet deep. The tank is divided into three compartments. The first compartment, into which the tar and liquor from the retorts and other apparatus are first deposited, is capable of storing 82,000 gallons; and the second and third compartments, each capable of storing 65,000 gallons, together about 154,000 gallons. All the walls have been built in cement, and the bottom is formed of cement concrete. The top is covered by brick arches, which are paved over to the level of the yard.

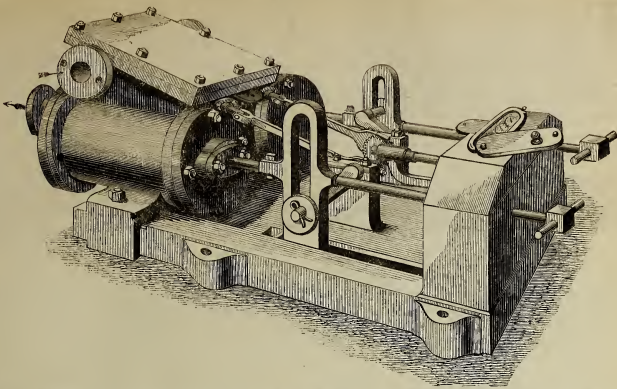
The most important extensions in connection with the Salford Gas-works have been made at No. 3 station in the Regent Street, which is divided into No. 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100. The station consisted of nothing more than a retort-house and storage for tar, ammoniacal liquor, and gas; that is to say, there were no purifying apparatus, station-meters, and exhaustors, and all that could be done there was to carbonize the coal. Now, however, these defects are remedied at a cost of about £70,000, and the station will be made complete in every respect. Two of Aitken and Young's analyzers, each 12 feet in diameter and 60 feet high, have been erected on massive masonry foundations. From these the gas will be carried into six wrought-iron annular condensers, each of which is 4 feet in diameter and 24 feet high. The gas is then carried into two sets of horizontal engines, and the station-meters, of which there are two, each capable of passing 100,000 cubic feet of gas per hour, are being erected by Messrs. R. Laidlaw and Son. The gas from the exhaustors goes to the scrubbers, of which there are two, each of which is 12 feet diameter and 60 feet high. On the top of each scrubber is a large machine, which is used for needed for distributing the ammoniacal liquor through the scrubbers, and which is reached by means of a spiral staircase round the outside. Two new washers, by Kirkham and Co., next receive the gas, which afterwards goes to the purifiers. These consist of six huge iron boxes, each 24 feet square, and 12 feet deep, which are supported on four columns, and are supported on four pillars and columns, and enclosed in a house 65 feet span by 190 feet long. This house is constructed for 12 purifiers, all of which will no doubt in course of time be required, but it is not intended to erect them at present. The base of the house will be used for revivifying the oxide of iron, which after this process, will be lifted from the floor up to the boxes by four elevators. The lids of the purifiers, each of which weighs 8 tons, will be lifted by hydraulic power. All the ironwork connected with this department is being furnished by the Pearson and Knowles Coal and Iron Company, Limited.

We may mention that some of the works are enclosed in a fine block of buildings, which, however, it is midway between Liverpool Street and Regent Road, cannot be seen to advantage, the only point from which it is at all observable being Egerton Street. The purifying-house adjoins Egerton Street, and on a line with it stand the exhaustor and engine house, the meter-house, the photometer-house, and the governor-house. The latter is a large building, and will be used for the workmen who will take their time. All these buildings, which are of a moderately plain character, together with all the other brick and masonry foundations that have been required, have been supplied by Mr. William Healey. All the pipes connected with these works are so placed that no one has to dig for them, and that lost time and money need never happen. We are informed that with the works at present in use 31 million cubic feet of gas can be made per day, but when the Liverpool Street works are completed this quantity can be increased to 54 million cubic feet per day—a much larger quantity than is at present required, but, as matters stand, the supply will be consumed within the district of the Salford Gas Committee.

REDUCTION IN THE PRICE OF GAS AT SWANSEA.—The Directors of the Swansea Gaslight Company have decided to make a reduction of 3d. per 1000 feet in the price of gas, to take effect on the 1st prox.

CONSCIENCE MONEY FROM A GAS CONSUMER.—The number of the *American Gaslight Journal* for the 2nd inst. heads the following letter, received from a correspondent at Philadelphia, as "Something Astonishing." "Mr. Editor: I enclose you a slip from the *Washington Evening Star*. Then gas companies have been asked to pay 'conscience money' to the poor, and to voluntarily make restitution, the Millennium must be near at hand. 'Our city gas company received an anonymous note to-day enclosing one dollar, and stating that it belonged to the gas company. The company has several times during the past few years received sums of money which the senders state have been wrongfully obtained.'"

DUNCAN'S PATENT WATER-METER.



We have recently been reminded of a promise, made in the JOURNAL some time since, to give an illustration of the meter patented by the late Mr. Thomas Duncan, Engineer-in-Chief of the Liverpool Corporation Water-Works. Many hundreds of meters have been made under the patent, and have been in use for some years in Liverpool and other places. They have also been adapted so as to become power engines, if needed, and are specially applicable for working the bellows of organs. Several of the leading organ builders use them, and have expressed themselves highly satisfied with their action; as they are silent, and under the immediate control of the organist. They can be placed either horizontally or vertically, and are attached to the levers which work the bellows by means of the crossheads on the connecting-rods.

The above engraving shows so clearly the mechanism of the meter, that detailed description is unnecessary. It consists of two cylinders, with pistons and slotted piston-rods working a short crank-shaft. The water under pressure is admitted alternately to each side of the pistons, and thus a rotary motion is given to the shaft. A counter is attached to the shaft, and thus a correct register is kept of the quantity of water passing through the cylinders.

PRESENTATION TO MR. MAGNUS OHREN.

On Friday last an interesting ceremonial took place in connection with the Crystal Palace District Gas Company, Lower Sydenham—namely, the presentation to the Secretary, Mr. Magnus Ohren, by the officers and workmen, of a testimonial in commemoration of what was happily termed his silver wedding (his twenty-fifth year of office) with the Company. The presentation was made in the van-shed, the only available place under cover extensive enough for the purpose, and where the men, after having received their week's wages, assembled in large numbers in front of three vans, which formed an extemporized platform for the speakers and the officers of the Company.

Mr. C. GARDNER, the Resident Engineer, addressing Mr. Ohren, said: A very agreeable duty has devolved upon me this evening. I have been requested, on behalf of those present and of all the employes of the Company, to offer you our sincere and hearty congratulations upon the completion of what must be an interesting period of your connection with the Company, this being the twenty-fifth anniversary of your holding the office of Secretary. During the whole of this long period you have earned the esteem and respect of all with whom you have been associated. I do not know whether I should be right in referring to this period as your silver wedding, for it is not always agreeable to be reminded that one is getting older every day; but it must be a matter of congratulation not only to yourself, but to all concerned, to know that your long association with the Company has been a successful one, as is evidenced by the fact that the Company have risen from very small beginnings to their present state of great prosperity. It is the belief of all of us that you have studied in every possible way to promote the welfare and comfort of the employes. To you they are indebted for the many little acts of kindness which have been shown to them by you on behalf of the Directors of the Company—I refer especially to their pleasant summer outings, and also to another little interesting ceremony that is about to take place. I have been asked by them to express their cordial thanks to you for all your kindness, and to request you to accept these testimonials of their esteem. The gifts have been subscribed for by all the officers and men, and consist of a handsome massive silver loving-cup,* which I now present to you, and a diamond ring, that will remind you of this your silver wedding. I think I need scarcely add more; the inscription shortly expresses the feelings of all, and I have merely to ask you to accept this testimonial, wishing you "A Merry Christmas and a Happy New Year," and trusting that you may long be spared to remain with us in your present position. We all wish most cordial health and happiness to yourself, Mrs. Ohren, and your family.

These remarks were received with loud and prolonged cheers.

Mr. OHREN said: Brother officers and brother workmen, for we are all

* The cup, of beautiful workmanship of the seventeenth century, and weighing 73 oz., was supplied by Geo. Lambert and Co., of Coventry Street, W., and bears the following inscription:

This Cup, together with a Diamond Ring, was presented on Dec. 24, 1880,

MAGNUS OHREN, Esq., Assoc. M. Inst. C.E.; F. Chem. S., by the Officers and Workmen of the Crystal Palace District Gas Company, in commemoration of the completion, this day, of his 25th year of office as Secretary of the Company, and in testimony of their appreciation of his uniform kindness and interest in their welfare during the whole of that long period.

workers in this great hive—and that we work together in goodwill and harmony is fully shown by the object which now brings us together—I feel that I should commence any remarks I may have to make by stating that this is the happiest moment of my life, and that I thank you from the bottom of my heart. I cannot, however, say this without reservation, for I feel that I ought to scold you for the too great zeal you have evinced in my favour. The first intimation I had that a presentation would be made to me was from the Chairman of the Testimonial Committee. The Committee thought that it would be best that, of the several things which they considered would form an acceptable present, I should be asked to make a selection. I need not say that when the amount of money collected was mentioned, I felt that I could not possibly accept so valuable a testimonial, and I desired that it might be reduced one-half. This, however, I was told could not be, since the money was not only subscribed, but paid, and in the hands of the Treasurer. But I felt that I really ought to take the opportunity of scolding you for the extravagant manner in which you had responded to the call made upon you, and I can only forgive you on one condition. As Mr. Gandon has said, I look upon this as my silver wedding to the Company, and the condition I impose is this—that in twenty-five years time, at my golden wedding, you shall be less lavish with your money in presenting your testimonial. (Cheers and laughter.) Now, as that is off my mind, I may turn to the more legitimate way of recognizing such an event, and express my debt of gratitude to you for this lasting proof of your esteem and regard. Twenty-five years ago this day I took charge of these works. I say these works, although they were very different from the present works. At that time we had in use four beds of retorts, and were carbonizing 10 tons of coal per day. We have now 50 double or through beds of retorts, more than equal in size to 100 of the old beds, and we are carbonizing 257 tons of coal per day. At that time we had five stokers and a total of eight constant men; we have now 84 stokers and a total on our pay-sheet to-day of 343 men and boys. We then had one gasholder to contain 110,000 cubic feet of gas; we have now five, having a capacity of 2,430,000 feet. We then had 500 customers; now we have 8500. (Cheers.) We may imagine what Sydenham was at that time. It was first lighted by the Sydenham Gas Company in September, 1852. The works were very small, and, in fact, Lower Sydenham was rather out of the world. Let me give you an idea of its remoteness from London. The London, Brighton, and South Coast Railway had then only been a few years in existence. One of our service ladies required a pick, and was anxious that it should be of a certain weight and size. I told him he might go to the Borough and choose one or two for himself. "The Borough?" said he. "Where is that?" (Laughter.) I told him it was a short way from London Bridge, and that if, when he got out of the train, he turned round to the left, he would soon come to the place. "Why," said the man, "that is in London. Oh! I should not like to go there, Sir, because I might lose myself." (Laughter.) I told him that if he had never been to London he should have the opportunity then; but he nearly cried to think of going—in fact, he would not go, and I had to send some one else. Is Evans here?—the inspector of main lines—well, he is the man. (Much laughter.) In the spring of 1854 the Crystal Palace District Gas Company took a lease of the Sydenham Gas-Works. The Crystal Palace was commenced at Sydenham in 1852, and was opened in 1854, and from that time our works began to grow. The Metropolitan Board of Works were constituted about this time—in August, 1855—and the Boards and Vestries were commencing their duties with vigour; but it was not till long afterwards that we had lamps in this district. For a considerable time I had to walk home from the office to the Railway Station with a lantern. I used to leave it at the station at night, and bring it down with me on my return in the morning. There were ditches on each side of the road, and travellers were so rare that if one fell in he might remain there a week before any one came that way to pull him out. (Laughter.) All our roads were now lighted, and there are at present about 2000 lamps in the Company's district. Thus we have grown, and to-day we are one of the most successful gas companies in England. But I must not detain you longer. It was hoped that we might have met and had supper together, but this was found to be entirely out of the question—first, because we have no place nearer than the Crystal Palace that would hold us all; secondly, because you could not all leave together, and as season like this our special care and attention are required in order that our customers may be well supplied with gas. If, however, you do not get a supper, you will, by the liberality of the Directors of the Company, be supplied each with a joint of meat before you leave. (Cheers.) There are 243 joints waiting to be carried off. You cannot say that we offer you the "cold shoulder"—(laughter)—for most of them are legs such as any

of your wives may be proud of—(loud laughter)—stop a bit, I have not finished the sentence. I mean, when well cooked, and served up at her husband's table. I must now conclude by again thanking you for these beautiful articles you have given to me. The one when I use in winter or summer, will bring to mind the many days we have passed so pleasantly together, and I shall never look upon the ring without thinking of the great pleasure I have experienced this night, and I again thank you not from the bottom of my heart, but with my whole heart. (Loud cheers.)

Mr. Anstee (the Chief Clerk) then proposed that three cheers should be given to Mr. Gandon, the Chairman and Treasurer of the Testimonial Committee, adding that Mr. Gandon and Mr. Ohren were like the Siamese Twins, so completely were they bound up together in the interests of the Company.

The cheers having been heartily given, the men adjourned to another part of the works, where the Christmas joints were distributed, each man receiving a very handsome piece of meat for his next day's dinner.

CHRISTMAS AT THE YORK GAS-WORKS.

On Friday last, when the workmen at the York Gas-Works assembled for their wages, Mr. C. Sellers, the Company's Secretary, gave his usual Christmas address. He said: "Fellow workmen, let me again express the pleasure I feel at meeting you once more upon the platform of Christmas, and while I give to each and all of you my best wishes, let me hope that health and happiness may rest upon all your homes. Home to me is a vital question, because I know, and you know, that where a fire-alarm comfort. On a cold day, and in the very apt to get away. On former occasions I have referred to Christmas customs, and pointed out the folly of excessive indulgence in what are called the drinking habits of Society. I shall not now dwell upon this point, but at once dismiss all sentiment, and repeat what I have often told you before, that for a man to be drunk is to be degraded, vulgar, and unmanly. I am sick of having to put the question 'Is he new comers upon the work—did you steady or are you sober?' It is simply a polite way of saying do you ever get drunk and make a fool of yourself? But these remarks do not apply to our old hands, for in respect to sobriety I am proud of them. I will just tell you of an observation I made upon this subject on the incident last summer. I was in Antwerp, Bruges, and Paris, three of the largest cities in Europe. I was in the streets at all sorts of times, but although I went through working-men's quarters in Antwerp and Paris I never saw a man drunk, nor did I ever see a dirty or shoeless child. How far this sobriety—noticed by others as well as myself—in France and Belgium has to do with the fact that manufacturers there can, in ironwork and other trades, more than compete with English manufacturers, I am not going to say, but you will all agree that, socially, morally, and commercially, sobriety is an important item in the prosperity of any people. And now, for our mutual benefit, let me direct your attention to a prevailing custom, the only one which I consider worthy of your notice, and that is the fault of people setting up their opinions for facts and speaking with confidence about things when they have scarcely a title of foundation for what they say. In business this practice is a nuisance, and as our business increases causes no end of trouble. In fact, you may take it that when a man raises and in public life, and upon his opinion, you will always find him in hot water, and, as a rule, wrong. I must now forget that in a Court of Justice, with plenty of swearing on both sides of a case, it takes twelve jurymen to find the truth, and sometimes even twelve cannot find it. Of course, I must say one word about our old friend, the electric light. We are to give the additional works, and are about to assume larger proportions than we have hitherto done. Some people shake their heads ominously—although we know that many anti-gas folks have very little in their heads to shake—and say that we shall not want the new works, that the electric light will take the place of gas, and that we shall be no more. Now, without going into detail, and without wishing to depreciate the electric light, let me, with the greatest confidence, parody Tennyson's 'Brook,' and tell you that, with the best and most independent scientific information upon the subject, I am decidedly of opinion, speaking practically, that—

Light may come, and light may go,

But gas will never over.

Over a hundred little presents, in the shape of books, toys, &c., which Mr. Sellers had provided, were then distributed amongst the men for their children.

THE RATING OF THE SHOTLEY BRIDGE GAS-WORKS

AND LANE.

A settlement has just been come to between the Shotley Bridge and Conselt District Gas Company and the Lancaster Union Assessment Committee as to the disputed valuation of the Company's works and plant. As far back as the July meeting of the Assessment Committee, the rating of the works was taken into consideration, the main facts of the case being as follows:—

The Company's property extends through five different townships or parishes, and the Overseers of one of the parishes—viz., Benfieldside—within which the manufacturing plant, buildings, &c., are situated, had increased their assessment against the Company from £860 to £1,400. The alleged reasons for this increase were that the Company had expended £10,000; that all the land, buildings, manufacturing plant, and cartage over the highways was in their parish; and that whilst the adjoining parish—Conselt—had none of these burdens, it had an equal rateable value to Benfieldside parish, simply on account of a little greater consumption of gas. The assessors contended the principle of rating on receipts and expenditure, maintaining that capital cost was the proper basis of valuing the works, and that £140 more rateable value was fairly due on the capital cost of the works at 5 per cent.

The Secretary of the Company (Mr. M. Richley) appealed against the assessment, and stated that the property in question had been valued some years ago by Mr. T. F. Hedley, a gentleman whom the Assessment Committee employed to do it for them, and who made an analysis of the works and their earnings in each parish, distributing the same accordingly. Since that time all the parishes had increased their assessments as the value advanced and this was a thing which had never been done before. It was necessary to do so, as the £140 increase proposed followed closely upon previous advances, and there were really no grounds for any single parish taking in hand and valuing the Company's works in this way piece-meal. In support of his contention he read the opinion of Justice Black-
burne in connection with the appeal. *The Phoenix Insurance Co. v. The Parish of Lee*, who said: "The rateable value of the premises to be determined, according to the Parochial Assessment Act, according to the rent that a hypothetical tenant, making the suitable deductions, would give for the rateable property, and the sessions had quite properly proceeded to try to ascertain the value of the property in this way. It was a portion of a much larger property which the Gas Company possess in this parish and in others. The first thing the sessions had to do was to ascertain the rateable value of the entire thing which the Company possessed, and afterwards to see what portion of it belonged to this parish." This, Mr. Richley said, was now the custom observed in all practical

valuations of gas-works; and the Company objected to their works being assessed on capital cost. They also protested against the Overseers doing it in place, as contrary to the principle of the Parochial Assessment Act, as laid down by the Superior Courts.

After some further questions relative to the works, Mr. Richley was asked to retire, and, on being recalled, the Committee admitted that it was evidently irregular to assess the Company in the manner attempted, and they would adjourn the case either to call in a practical valuer, or to be supplied with copies of the Company's reports for the three previous years, and a statement of the capital expended in each township, to aid them in making their own valuation.

At the next meeting of the Assessment Committee the Clerk read a letter which had been addressed to him by Mr. Richley, in the course of which he said: "Our Directors are willing to afford all necessary information, to test the rateable value of their works; but are of opinion that, as their works are partly in a Northumberland township, and others in Lancashire Union, the balance-sheets applied for would not lead you to the point as regards Lancashire Union. Without going into the tedious process of abstracts and measurements for capital expended over the six townships, the Directors think the simplest mode of arriving at the assessment of the various places is on the principle already laid down—i.e., the parochial earnings. I have gone into the matter by Mr. Hedley's process of valuing, and find that the whole rateable value is within a few pounds of what it now stands at, viz.,—£896 net; manager's house, £12 10s.—total, £910 10s. Your Committee put down an increase of £135, to which our Directors could not assent, as it is much higher than the value placed upon other large works in the Union. However, to save a very tedious and troublesome inquiry, we are prepared to submit to an increase of £135, making the total rateable value £1,045. If you, Committee, re-distribute it accordingly, after giving Benfieldside township its allowance in respect of the works, lands, and buildings therein situated. I stated before your Committee what the percentage of earnings was in each township, viz.,—Benfieldside, 31.9; Conselt and Kintley, 34.9; Elchester, 13.3; Medomesley, 19.9. Moreover, your Committee stated that the amount allowed, by order of the valuer, to Benfieldside, in respect of works, land, and all the indirectly productive capital—which at that time was estimated at £4000—was £140 net of the total sum. The same kind of capital we now estimate at £6000, and that at the same amount would be £140 net of the total sum. Now, should your Committee feel disposed to entertain the suggestion of our Directors—i.e., to fix the total value at £980—and which they think is fully higher than the average round about the district, then they (the Committee) can easily divide it amongst the townships themselves from the figure already given; and it will be done by the percentage of apportionment as stated of £770, that the distribution is not proportionate, and appears to be too high at Conselt and Kintley, and too low at Elchester and Medomesley, and is more unjust to these two latter townships than to Benfieldside. It is possible Mr. Hedley might be led into some error in his apportionment by insufficient care being taken as to the boundaries of the townships. However, that is now in your power to remedy, and the Directors hope that these suggestions will enable the Assessment Committee to effect an equitable settlement."

The following statement, showing the amended assessment proposed, was also read at the same meeting:—

Township.	Mr. Hedley's Valuation.	Present Valuation.	Rate according to Gas Company's Average.	Proposed Future Rate.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Benfieldside . .	323 0 0	360 0 0	436 0 0	463 0 0
Conselt	353 0 0	360 0 0	309 0 0	277 0 0
Elchester . . .	10 0 0	0 0 0	51 0 0	54 0 0
Ireston	78 10 0	100 0 0	102 0 0	108 0 0
Medomesley . .	36 10 0	55 0 0	102 0 0	103 0 0
Totals	806 0 0	893 0 0	980 0 0	1000 0 0

In the course of the discussion, one of the members, in proposing that the rates be altered as above shown, said it was quite possible that there had been mistakes made in the valuation of the works, and that the boundaries of the various parishes, as he thought the matter could be arranged without going to the expense of a new valuation. If they struck a mean between the claims of the Overseers of Benfieldside and the statement of the Company—and the latter admitted that the value of their works had increased from £4000 to £6000—they would be going as near the mark as they could, and the matter would be settled. The rate proposed was an increase of only £107 on that at present paid.

These figures were accepted by the Company subject to the assessment remaining undisturbed for a few years; and so, as stated above, a settlement has been arrived at.

AMERICAN GASLIGHT ASSOCIATION.

[From the "Official Report" in the American Gaslight Journal.]

(Continued from p. 977.)

After the reading of the paper by Mr. G. G. Ramsdell, on "Gas-Engines," which appeared last week, there was the following

Discussion.

Mr. CARLWRIGHT asked Mr. Ramsdell the price he charged for gas, so as to enable comparisons to be made in other places. Mr. Ramsdell said the price was 3 dols. per 1000 cubic feet. He added that he wished to say a word in reference to this question of price. The price of his gas was 2 dols. 50 c. per 1000 feet, but his Company had the idea that the machine was going to be an enormous consumer, and reduced the price to 2 dols. per 1000 feet; but he had since become convinced that it was not, and as a result he had given 14-10ths to make the engine work well. He had, however, known of gas-engines being run at 8-10ths and 10-10ths, and was satisfied that, with proper sized pipes 10-10ths gave ample supply to drive any of them.

Mr. LITTLEBASKOT asked what was the lowest duty pressure the engines could be run with. This, he said, was a very important consideration. If they required a large pressure, of course, the leakage during the time they might be running would be in excess even of the advantage gained by the sale of gas. He found that it required about 10-10ths or 12-10ths of an inch, but supposed it would depend upon the size of the main pipe. He said that he had run the engine with 14-10ths, but he had after he had put the engine up, that he had made the connection too small. He ran from the main a 2-inch pipe, while he should have run the full sized 3-inch pipe. It was volume of gas that was needed, not pressure; they had very frequently run the engine when there was only 12-10ths of an inch, but as a result the engine was very satisfied with it. He found after he had put the engine up, that he had made the connection too small. 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Mr. RAMSDELL said there was in an elevator building, almost 150 feet from the engine, also in the corner of a lamp room, but none from anywhere else. They were supplying gas round the same building, but there was nothing consuming gas within probably 300 feet of the elevator building. In this distance they had not any difficulty.

Mr. BURTIS: You refer to the 17-horse power engine, do you not, as being supplied with the 2-inch gas pipe?

Mr. RAMSDELL said he did. The other engine was originally put in the third storey; but they subsequently moved it into the basement. He should have done this himself; but did not know anything about it until the work was nearly all done, and then he found that the pipes, while they were ample above, were too small in the basement. He notified the proprietor that this would have to be changed, and he acknowledged the reasonableness of making the change. The pipes were only 1-inch.

Mr. BURTIS: What is the size of that engine?

Mr. RAMSDELL said it was 14-horse power. There was one put up since, where the gas came from a 4-inch pipe, and that was the one he referred to when he spoke of their running at 10-10ths and 10-10ths pressure. This was all they gave, and the engine was working satisfactorily when he last heard of it. He did not think, when the engines were put up properly, there was any trouble at all in getting them to do their whole work with the ordinary pressure.

Mr. LITTLEHALES, in reference to the pulsation question, said there was a 4-horse power engine affixed to their main—about a 2-inch one for nearly 400 feet. At the inlet of the gas-bag the pulsation was perceptible; that is, before gas entered the engine.

Mr. RAMSDELL, in regard to the fluctuation of pressure, said he had had some 12 or 15 engines at work scattered throughout the city of New Orleans, but had not made any difference in pressure on their account. They ran at from 8-10ths to 10-10ths in the daytime, and caused no complaint whatever. The engines were run from a separate service, but, at the same time, did not do the service through which gas for illuminating was supplied, and they had never had any gas cuts. The engines were giving satisfaction in every case, and he had never been called upon a second time after they were started, even when they were in the hands of those who had never seen a gas-engine before.

Mr. HAZARD said he had seen a number of gas-engines put up, and had yet to hear the first complaint about them. In the case of one engine of 2-horse power he put up he ran a separate 1-inch service-pipe about 90 feet to the back end of the building; and the machine worked well with about 10-10ths of pressure. In fact, if there was just pressure enough to overcome the friction of the pipe leading to the engine, the engine itself would work well, sucking, as it were, gas from the main without any pressure. He had no fear for gas-engines, and thought that after a while they would become more popular than steam-engines for anything under 15 or 20 horse power.

Mr. FOASTELLER wished to add that he had used a gas-engine to take the sting out of the electric light. The keeper of a large saloon who had determined to introduce the electric light came to him and asked as to what he considered the best engine to use, and he succeeded in getting him to use a gas-engine as his motive power. So that gas managers might comfort themselves with the thought that even if electricity did take away some of their large customers, it might still sell them gas to produce their electric light. He put the average consumption of gas in these engines at 20 cubic feet per horse power per hour.

Mr. STARR: That would be 80 feet an hour, or 800 feet a day.

Mr. FOASTELLER said the engine was working at its full power. He had found that where the engine was working at its full power, it would generally explode with every stroke; but when the power was thrown off and the engine was merely in a condition to operate, it would run 15 strokes, before an explosion took place. The work thus was run at a low pressure, and was in direct proportion to the amount of work that the engine was doing, up to its full power.

Mr. WEARE inquired why it was there was so much difference between the cost of a gas-engine and a steam-engine. He said he could purchase a 4-horse power engine, complete, for 350 dollars; but a gas-engine cost about 400 dollars.

Mr. HELME said he had thought this matter over a good deal, for he had a lively interest in gas-engines. In the first place, the makers of them had to pay a considerable royalty. Besides there was a large amount of money spent in making experiments, and getting the engine up to its full power, and then in making experiments, and getting the engine up to its full power. He had found that where the engine was working at its full power, it would generally explode with every stroke; but when the power was thrown off and the engine was merely in a condition to operate, it would run 15 strokes, before an explosion took place. The work thus was run at a low pressure, and was in direct proportion to the amount of work that the engine was doing, up to its full power.

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in exhaustor-houses was self-evident. As a general rule breeze from coke was valueless when offered for sale; but it became very valuable fuel to the company itself. In his case they used for fuel the breeze from the coke heap. It would be valueless if offered for sale, but was of great value as fuel on the works. He did not think there would be any practical difficulty in running exhaustors with gas-engines, because, although they cost a good deal more, a properly adjusted compensator would get over the whole difficulty. It was a practical question, however, of having the fuel on hand. Most gas companies had a large amount of material already on hand that was valuable for fuel, but which, if not used for that purpose, would not be worth a dollar.

Mr. HAZARD thought there was a mechanical difficulty in the way of making a gas-engine work as satisfactorily as a steam-engine. The want of uniformity of speed was the trouble that must be overcome. The difficulty was to get a varying movement from a fixed speed which would accommodate the exhaustor to the amount of gas being made and brought forward.

Mr. LITTLEHALES said the best answer to this argument was that within the last four or five years they had been using quite a number of gas-engines for running exhaustors; and he did not think there was any serious practical difficulty in the way of doing so. Of course, if the works were conducted so that a number of retorts were charged at once, and then quite an interval when none were being charged, some trouble might arise; but this would be a defective arrangement in regard to driving, and not a mechanical difficulty in the way of using gas-engines for running exhaustors.

Mr. HAZARD said he had known of attempts being made to apply gas-engines to the driving of exhaustors, and of alterations that had been made in them, so as to obviate the difficulties that had been referred to; but all the information he had upon the subject was to the effect that, even with the improvements that had been introduced, they did not work satisfactorily when applied to exhaustors. He did not believe that the mechanical difficulty which he maintained was inherent in the machines was likely to be soon overcome.

Mr. STARR thought the difficulty might be obviated by having a compensator, so that when a large volume of gas came it would close itself again.

Mr. HELME said he did not believe that compensators would be found to work satisfactorily on gas-engines that were used to run exhaustors.

Mr. RAMSDELL said he had fixed a compensator in place of a governor in the gas-engine used at his works for crushing coke, and he found there was no objection in the gauge with the compensator.

The President said he had never met with any more serious objection to the use of gas-engines than the quantity of gas used to actuate them. People seemed afraid of the addition that would be made to their gas bills. So far as his experience went, in advocating the use of gas-engines he had not found the same difficulty as he had met with in the case of steam-engines, that they were not used in the gas-works among his own people. He could always point to the fact that their engines and boilers were erected years ago, and they could not afford to throw them on one side, though they recognized the superiority of gas-engines in many respects.

The discussion was then brought to a close.

The proposed alteration in the time of meeting was next taken into consideration, and some considerable discussion ensued on the suggested change of the date of assembly. Eventually, however, on a vote being taken, the Executive Committee's recommendation to amend the constitution was not adopted.

[The subsequent proceedings at the meeting we shall notice in the next volume of the JOURNAL.]

THE GLASGOW EXHIBITION OF LIGHTING AND HEATING APPLIANCES, &c.

It may be remembered that during the recent Exhibition of Lighting and Heating Appliances, &c., held in Glasgow, the Committee of Jurors appointed to examine and report upon the cooking stoves exhibited, and on which adjudication was requested by the exhibitors, had a sort of competition by having no fewer than nine of them subjected to a crucial practical test in the way of roasting a leg of mutton and baking two or more loaves of bread, both of the operations proceeding at the same time. The exhibits were arranged throughout the whole length of the Drill Hall (which the exhibition was held in), and along the line, the competition excited a great amount of interest amongst the visitors, who were very numerous on the evening when it took place; indeed, many of them seemed to take almost as great a degree of interest in the exhibitors and their standpoints. The Committee of Jurors on Cooking Stoves (Section IV), consisted of Mr. Samuel Stewart, Corporation Gas-Works, Greenock; Mr. George R. Hislop, F.C.S., Corporation Gas-Works, Paisley; Mr. Charles Thornton, Practical Cook and Restaurateur, Glasgow; and Mr. John L. Bruce, I.A., Glasgow. The last-named gentleman enjoys no mean reputation as an expert in connection with heating by gas, and it was therefore natural that he should be selected to act as the Convener of the Jurors in Section IV. Their report recommended that the following awards should be made:—

First—Certificate of Merit (Highest Award).—The Argyle Ironmongery Company's "Universal Domestic Cooking Stove"; Mr. Charles Wilson's "Edgemoor Gas Kitchener"; Mr. Wright's "Gas Cooker," No. 492, exhibited by Messrs. Andrew Shaw and Son, Glasgow.

Second—Honourable Mention.—Cox's Patent "Despatch Cooker" and Cox's "Save-All Cooking Stove," per Messrs. J. C. Stark & Co., Torquay; and the "Sun-Dial Stove" (Reflector), per Messrs. Watt and Son, Glasgow; The Argyle Ironmongery Company's Combination Coal and Gas Range.

In their report, the Committee stated that "generally speaking, the points to be considered in making a comparison between the various stoves, the economy in gas burned in proportion to the size and cooking capacity of the stove, together with its heat-conserving power. 2nd. The cooking accommodation and workmanship in proportion to the prime cost. 3rd. The convenience of the management for general domestic purposes."

The first point considered they themselves are entitled to separate, and to one of the stoves submitted—namely, that of Dr. Adams, your jurors desire to express their high approval of the method of burning the gas as adopted in it, and which has to their belief secured the advantages of the perfect combustion in the atmospheric or Bunsen burner, without its liability to be extinguished by draught, or shock, or to "strike back" when lowered; together with much more than the radiant energy of the ordinary white flame—thus obtaining what is, in their opinion, the most perfect gas-cooking burner known to them. Your jurors, therefore, think that the burners by themselves are well worthy of a Certificate of Merit, but do not consider that they themselves are entitled to separate the burners from the whole apparatus as entered for adjudication, and to which, in its present primitive form, they do not feel justified in recommending any award. For these reasons they leave it to the General Committee to act in this instance as they may deem it best."

proposed 15 years ago. A point was raised by Mr. John Laidlaw which revealed rather a peculiar state of affairs. Despite the knowledge that the works were in a state of disrepair, the Company at one time, when they had £500 or £600 to dispose of, increased the nominal value of the shares from £5 to £6, and now the Company propose to issue additional shares at par to execute the repairs which had been proved to be necessary in former years. This division of surplus funds may be right enough, but in the present knowledge of facts, some state of affairs, it is estimated that the meeting approved of the recommendations of the Directors, minus that relating to borrowing.

The gas-works at Forfar seem to be in a flourishing condition. At the meeting of the Gas Commission on the evening of the 20th inst., the Manager (Mr. Baylis) reported that the gas manufacturing plant of the period last year, being an increase of 625,600 cubic feet.

It is peculiar, but it is nevertheless consistent with fact, that at Dumbarton, where neither effort nor expense is being spared to introduce the electric light into the engine and boiler sheds of a large ship-building firm, the consumption of gas is steadily on the increase. To a certain extent this may be accounted for by the multiplicity of cooking and heating stoves in the town, and the balance of increase may be due to the natural increase in the number of consumers. I may mention that this is not the first time that Messrs. Denny have brought the electric light into requisition, and it is quite within the range of possibility that they may soon again revert to the old condition of affairs. One of the aims which the firm have in view is to get a powerful light and in such a position that it will be protected from the attacks of the rough, thoughtless boys usually employed at such works, but it may be pointed out that a chip of iron will break a carbon pencil, or injure the delicate machinery for regulating the electric current, quite as readily as the glass surrounding of a gas lamp, whilst in the latter event the loss arising from stoppage of machinery, which would inevitably follow the extinction of the electric light, would be infinitesimal. It is also to be remembered that a member of the firm on a former occasion lost the bet of a new hat that the then introduction of the electric light would be permanent; but it has not transpired whether he is willing to repeat his speculation.

In the local prints there have been many complaints, during the past year or two, both in respect of the water supply and of the water supplied to the town of Banff, and now the Police Commissioners of the town are determined to take action. A Committee has been appointed to consider whether, under their Act, the Commissioners have power to deal with or take over the works of private Companies. In moving the appointment of this Committee, the Police Commissioners stated that the water supply and the condition of the gas had long been complained of by the inhabitants as subjects requiring attention.

The town of Whithorn, in Wigtonshire, has been the scene of a good deal of wrangling in connection with the water supply. The Local Authority proposed to sink additional wells, but the opinion of the quantity for the inhabitants; but the Board of Supervision, which is supreme in these matters, say they cannot express any opinion as to whether the proposed wells would be sufficient in quantity and quality for the burgh. Then follows this important statement:—The Board consider that the daily supply of not less than 150 gallons per head of the population is not too much for domestic use and sanitary purposes. The Board's experience as to quality has been that money spent in sinking wells in or near houses is thrown away, because the water, though pure at first, does not long remain so. If the Local Authority persist in obtaining a supply from wells, it will be the Board's duty afterwards to ascertain whether the quantity and quality are sufficient. The Board again recommend the Local Authority to obtain information as to a gravitation scheme from a competent engineer, and until they have done so they cannot accept the suggestion that such a scheme is impracticable. In view of this statement, the Local Authority have resolved to call a meeting of the ratepayers to consider the question.

The Town Council of Galashiels have resolved to borrow £10,000 from the Public Works Loan Commissioners, to meet the extra cost of the water-works.

GLASGOW, Monday.

I understand that there is every prospect of an effort being made at an early meeting of the Town Council of Glasgow, to overturn or counteract the resolution of the previous year, in relation to the spending of the sum of £5000 from the past year's gas surplus in the way then mentioned. Since that resolution was passed a feeling has arisen outside—and has found expression at two meetings of Municipal Ward Committees—that all profits made by the sale of gas should be devoted to the reduction of the rate of gas, that is, that the effort to which I refer be made, it will undoubtedly come from a gentleman who is at present outside the Town Council, but who, at the first meeting of that body, will be elected to fill a vacancy now existing, and which was lately caused by the lamented death of ex-Mr. M'Intyre, a gentleman who was long an active and useful member of the Corporation Committee. There is a great probability that the principle involved in the amendment, which had only six supporters at the last meeting of the Town Council, will have found a larger number of supporters when the question is again brought forward for consideration.

It is scarcely within my province to give any detailed notice of the professional career and status of Mr. B. M. M'Creae, the well-known Gas Engineer at Dumbarton, whose death has been announced; but having known him when he occupied the much higher position of Engineer at Airdrie, I may be permitted to say a word or two, by way of indicating the great degree of respect which was entertained for him by his many friends and professional brethren in the West Country. He certainly stood high in the ranks of gas engineers and engineers in Scotland, as evidence of which was a number of cases in which he was consulted in the West and South-West of Scotland to assist in arbitration cases, and otherwise to give professional advice in connection with gas-supply undertakings. He bulked so prominently in Scotch gas affairs that, for a time or two, there was a gap left by his lamented death.

Mr. W. Arnot, F.C.S., Principal Assayer of Edinburgh, has just reported regarding the quality of the gas supplied to the Glasgow Gas Works, which, he says, of good quality, having an illuminating power of 29·9 standard candles, being free from sulphur compounds, and containing only traces of ammonia. This is certainly a good character to give a gas supply which is so cheap as the cheapest in Scotland.

The Director of the Hawick Gaslight Company have lost no time in carrying out the resolution of the annual meeting of last May, in relation to regarding the acquisition of ground on a more convenient site for their gas-works. On Thursday last they feued, by public auction, two plots of ground at Wilton Glebe, belonging to the Burgh Authorities, one of them comprising of 44 acres, which they secured at £25 per acre per annum, and smaller one of 10 acres at the same rate.

Some time ago a powerful Sugg street-lamp was purchased by the Paisley Municipal Authorities. It has now been erected about the centre of County Square, which is certainly the most public place in the town. It was lighted for the first time on Friday night, when it considerably

eclipsed the ordinary lamps which fringe the causeway all round the square. Mr. Sugg, Master of Works, has designed a very suitable section for the lamp-pillar, consisting of dwarfed octagonal granite pillars to form the angles of the square, which is enclosed by a pretty ornamental balustrading. The lamp, standing fully 18 feet high, was much admired by the townspeople, who are already urging the propriety of having another lamp of the same kind erected at the Greenock end of the street. It was pointed out to some people who "go in" for electric lighting are rather difficult to please, for I have lately heard of no fewer than three firms who had adopted the Siemens system in their several establishments turning out the apparatus, and substituting the Gramme dynamo-electric machine and Crompton lamps. Some appearance of truth is given to the statement by an advertisement in one of the leading daily papers of a lot of Siemens apparatus being for sale, even down to a "quantity of carbon points." It goes on to state that—"If wanted, a trial can be given before purchasing;" but the advertisement would be more complete if it had stated why the previous owner or owners had deemed it proper to give up using it.

At the last meeting of the Police Commissioners of the Burgh of Wishaw a report was submitted by Mr. Tait, the Burgh Engineer, which stated that the outlay in connection with the water supply up to date was £12,000, which, with upkeep and repayment of money borrowed for it, it was estimated would come to an annual charge of £340. The consumption was taken at 102 million gallons per annum, of which 73 millions was consumed within, and 30 millions outside the burgh. The cost per million gallons was, therefore, 48. 5s. It was also stated in the report that the outlying parts were only paying £185, and that the burgh ratepayers contributed £255 towards the total income.

On the 11th inst. the amount of water in store in the Greenock reservoirs was 285,485,643 cubic feet, being equal to a supply for 81 days for all purposes. This was less than the supply in store at the same date last year, but quite sufficient to remove all fear as to a scarcity.

It was also stated that the Glasgow Water District is much excited over the water question. A proposal to form a special water district has just been defeated by a majority of ratepayers attending a public meeting held to consider the subject.

A fair amount of business has been done in the Glasgow pig iron warrant market since last report, and Friday's closing prices were for sellers, 51s. 6d. for and 51s. 40d. one month, and 51s. 6d. for buyers.

There is practically no change to report in the condition of the Glasgow coal trade. The demand will for some days be lessened on account of the holiday festivities.

THE LANCASHIRE COAL AND IRON TRADES IN 1880.

(FROM OUR OWN CORRESPONDENT.)

In neither the coal nor the iron trade of this district can the results of the operations of the year now closing be considered satisfactory. In the coal trade particularly business has been carried on under most discouraging circumstances, and in many cases at considerable loss to the proprietors of collieries. The year opened with anticipations of improved trade, and prices, which had gone up slightly since the close of 1879, still exhibited a very decided upward tendency. Best Wigan Arley was in some cases quoted at 9s. 6d.; common qualities, 7s. to 7s. 6d.; Pemberton four-feet, 6s. 9d. to 7s. 6d.; common round coal, 6s. to 6s. 6d. This state of things was, however, of very short duration. The demand rapidly fell off, whilst the market was burdened with an increased production of coal, which has been stimulated by the prospects of better trade, and large surplus stocks being pressed for sale, prices were forced down to a lower point than had been known in the trade for many years past, common coal being offered as low as 4s. 6d. per ton at the pit's mouth, and best Wigan Arley at 5s. 6d. per ton. The coal trade could hardly be considered in a depressed condition all through the summer, and, in the majority of cases, the prices were not kept going more than about half time. Perhaps nothing could more strikingly illustrate the thoroughly discouraging condition of trade than the character of the competition for the gas coal contracts given out during the summer months, sellers, in their anxiety to secure an outlet for their coal, tendering for delivery over five years, and the largest consumers in the district actually restricted their selections to tenders for not less than three years. And not only was coal offered for these extended periods, but prices in some cases were below those at which gas coal had never been known to be tendered before, good screened Wigan district gas coal being readily obtainable at 4s. 6d. and 4s. 6s. per ton. During the last couple of weeks there has been a slight improvement in trade, owing to the winter demand for house-fire coals, and this has enabled colliery proprietors to obtain an advance of about 1s. per ton on coal, best Wigan Arley at the pit now averaging about 9s., common qualities and Pemberton four-feet, 7s. to 7s. 6d., and common Wigan mines about 6s. 6d. to 6s. 9d. per ton. Engine classes of fuel have not shown much fluctuation during the year, and have averaged about 4s. to 4s. 6d. for Wigan, and 3s. to 3s. 6d. for good slack at the pit.

In the iron trade the improved movement in prices which commenced in the autumn of 1879 continued during the first month or six weeks of the present year, and then, as may be seen from the quotations advanced their quotations for delivery into the Manchester district up to 72s. 6d. per ton, less 21 per cent. The demand for iron, however, now began to fall off, makers were unable to realize their last advance, and in April came the complete collapse of the speculative operations for shipbuilding which had for some time been going on, and less than a week had been bought on speculation were thrown upon the home market, and there was a rapid fall in local pig iron of about 7s. 6d. per ton, which was followed by a continued downward movement in prices, which in the course of about three months represented a total drop of about 25s. per ton. The fall was followed by a fall in the price of exports, and a further depression of prices; then another relapse, which left trade in a depressed condition as at any time during the previous year, and some sales of local forge iron were made at as low as 45s. per ton, less 21 per cent. During the last couple of months a considerable amount of buying has been going on, and prices have risen to 65s. 6d. per ton, less 21 per cent. The market in Manchester, at which they are now firm, and with the close of the year there appears to be a healthy prospect for the future. Finished iron has followed much the same course as the raw material, and bars, which got up to £9 to £9 10s. per ton in February are now offered at £5 15s. to £6 per ton, with but little advance in the meantime.

In the engineering branches of trade there has been an absence of any general activity, but many of the principal firms have been well supplied with foreign work, and there has been a gradual improvement going on, the number of men out of employment in the district being considerably less at the close than at the commencement of the year. The great commercial slump, however, has not been so severe as that the prices at which orders have been secured have been extremely low.

At the close of the year the wages question is beginning to agitate trade, and in the coal-mining industry there is every probability of strikes in several districts for an advance of wages.

THE YORKSHIRE COAL AND IRON TRADES IN 1880.

(FROM OUR OWN CORRESPONDENT.)

Taken as a whole, the year 1880, which is just passed away has been anything but a prosperous one for coalowners, while miners for many months worked short time, and were compelled to submit to reductions of wages. Unfortunately the labour market, especially in South Yorkshire, has been in an unsettled state. Strikes, lock-outs, and disputes have been of frequent occurrence, rendering trade exceedingly difficult to carry on; inasmuch as that coalowners scarcely dare enter into lengthy contracts. The proposed sliding scale fell through, owing to the owners and the men being unable to agree upon a basis; but in West Yorkshire the desired end was attained. Hence disputes have not been nearly so frequent as they were a short time ago.

The general aspect of the house coal trade for about nine months of the year was very quiet, while prices ranged so low that many collieries were worked at a serious loss, and as the year closes some are in course of being wound up, whilst others are set down, due to the discomfort of disappointed shareholders. The London trade, which forms so important a part of the business done in South Yorkshire, and at several collieries in the West Riding, has been generally very quiet over the twelve months. In the first month of the year the Great Northern Railway Company conveyed only about half the tonnage usually carried over that line from the Silkestone pits. As the year wore on this did not improve, for neither the demand for Silkestones nor that for Barnsley thick-steam coal materially increased until the month of October, when the returns showed that eight Silkestone collieries, which sent about 11,000 tons in January, forwarded 16,000 tons in October, and 17,800 tons in the following month. The demand for house coal for the Eastern Counties and for Lincolnshire was also for a moderate time, but has since improved.

The gas coal trade seems of late years to have become extended in the country, where several qualities of coal suitable for gas-making purposes are won. As is generally the case, most of the coal required is supplied on contract. Although it is not known in all cases what the contracts were placed at, it is believed that the coal companies had secured over a larger number of tenders to select from, whilst prices were certainly low. Amongst the gas undertakings which favoured South Yorkshire with part of their orders were the Nottingham, Derby, Grimsby, Stamford, and others in the Midlands, in addition to which a good tonnage was sent to the Eastern Counties and to Lincolnshire. The Grimsby Corporation placed 65,000 out of the 100,000 tons required with eight South Yorkshire colliery firms. Some of the works have resorted to the use of Silkestone, in preference to the thick-steam coal.

Although prices have ranged very low throughout the year, the steam coal trade has been very active, and during the export season a large tonnage was sent to Hull by both rail and water. Grimsby shipped a heavy tonnage from South Yorkshire, and Goole and Hull from the West Riding pits. When the contracts were placed early in May, the keenest competition ensued, so that great changes took place with regard to the distribution of the orders. The result was that some of the thick-steam pits worked very fair time, whilst others did not make more than three or four days per week.

Other kinds of fuel have varied a good deal at certain periods of the year, but throughout the whole period supplies have not only been plentiful, but prices have ruled low. The West Riding pits have done a fair business in slack and small coal for engine purposes. During the early part of the year this kind of fuel was bad to dispose of in South Yorkshire, but, owing to the large output of coke, the difficulty was considerably lessened. In no former year since coal has been worked in Yorkshire has there been such a vast outlay in machinery for grinding, crushing, and washing slack for coke-making purposes. At many collieries from £8000 to £10,000 has been expended on new ovens and machinery of the class referred to. In this way the coke has been materially improved in quality, and now commands a good sale in the North Lincolnshire and other iron-smelting districts. Towards the year closes, however, the trade, which was generally doing good, is on the wane, and prices are lower, whilst stocks are accumulating.

The finished iron trade has, with few exceptions, been quiet, and prices at times have varied a good deal. The make of pig iron has been about a uniform one throughout the year. There have been a very few changes in the number of furnaces in blast, and in the output of the same, from North Lincolnshire, which is now largely used throughout both South and West Yorkshire. The general foundries have been rather badly off for orders, and at most places only a limited number of hands have been employed. At the Thorncliffe Works, and one or two other places where there is good casting machinery, the business has been very fair. Plates and merchant iron have not been over largely produced, but with the exception of short intervals the demand for Bessemer steel rails, tires, and axles has kept up very well.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND IN 1880.

(FROM OUR OWN CORRESPONDENT.)

The year which is now drawing to a close has been a good one for the working classes in this district, as they have been more regularly employed than for three years previously. Wages have not advanced in any trade, and there is not much prospect that they will do so to any great extent in the forthcoming year. The present year has not, however, been a profitable one to the capitalists. At the same time the absolute loss of which characteristics is the least of the business, has been very much avoided. Most large concerns which in the last-mentioned period showed very considerable losses in the balance-sheets issued by them, have made their loss into a gain, and in several instances have been able to give their shareholders a dividend of five per cent.

The chemical manufacturers look upon the year as a very successful one, and the last year, but very many indeed, most of them—were of a speculative description. The middle men have had to take the chemicals over, and find a market for them as best they could. They have had to stand the loss; and as most of them were wealthy concerns, the losses to the manufacturers have been kept small. As the year wears on, it is unable to bring some awkward failures amongst some manufacturers and merchants at Newcastle over the past three months, through a shipping house, which had been concerned in speculation in chemicals, fire-clay goods, coke, and coals, becoming bankrupt.

The gas coal trade, the county of Durham was again very active last week, and the shipments were heavy. The contracting for next year has commenced, and in some instances for the highest qualities an advance of something like 3jd. or 5jd. per ton has been established, but generally speaking there is very little alteration in rates, from last winter's business. The leasing collieries in the trade are in some instances unable to bring more steam coal to the market, and the second week in January their books being quite full of orders until the second week in January, they have very few new contracts are entered upon for a longer period than twelve months. The house collieries are doing a very satisfactory business for present shipment; the demand, however, is not excessive. There is an

improvement in the value of steam coals, the local business done in manufacturing coals and coke and coking coals is very steady, and in the southern division of Durham somewhat better prices are realized.

There was rather a large arrival of sailing vessels in the coal ports last week. Most of the gas ships had been taken on to load before they arrived, so there was no great amount of sailing tonnage disengaged in the open market. Sailing ship freights did not alter from last quotations, but the steamers on offer being in excess of the requirements of trade, rates for them were low. The quotation was 4s. 1jd. per ton London, with other ports in proportion.

The chemical markets in the north-eastern towns have not shown much alteration upon previous quotations. Soda was scarce, alkali was weak, but other chemicals were unchanged in value. The fire-brick and other trades are looking for improvement, and a further advance of the year, especially for second-class sorts; the makers are trying to regulate their stock-making with that intent. At present the markets in the North of England are entirely void of speculation. The goods sold, whatever they are, go direct into consumption. In this particular the prospects of 1881 are very much better than of the previous year, and from the beginning to the end, has had to suffer from the effects of over-speculation, carried on to a very large extent in the early months of that year and the last three months of 1879.

The prospects of the finished iron trade for 1881, if they are not remarkably roseate, have a good sound appearance. The business on hand, say, in iron shipbuilding and in the manufacture of marine engines, is specially active, and if no more orders were coming than the establishments have on their books, they would keep them fully employed until next Midsummer. Recent business shows a rise in values from 10 to 15 per cent. upon the contracts made in May last for iron ships.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES

OF 1880.

(FROM OUR OWN CORRESPONDENT.)

The year which is just closing has been somewhat a remarkable one in so far as the iron and coal industries are concerned. Though not in all respects a very prosperous one, yet, as compared with the three preceding years, it claims a favourable comparison. As far as the coal trade is concerned, 1880 was a thoroughly good year, and the future prospects for the coming year; though scarcely so flattering, yet indicative of a steady growing improvement.

Twelve months ago the coal trade was of a buoyant nature, chiefly owing to the increased demand for smelting consumption, and rates were considered to be an upward movement. The iron trade had apparently taken a substantial stride towards a prosperous career. The markets were brisk, prices were on the increase, and there was a marked alteration for the better in the export trade. Orders on American account were numerous and of a surprising nature, so much so that it was only a few days ago that the great consuming market which had been looked upon as lost, was about to re-establish itself as an extensive field for the South Staffordshire productions. Furnaces were re-lit in all parts of the district, and the number in blast was raised from 25 to three times this figure. The commencement of the year saw the standard rates of market coal at £48 10s., which was a point higher than had been reached since the memorable prosperous season that closed in 1877. Following the increase of prices in raw and finished iron, agitation on the part of the miners was made for an increase of a penny per day for each shilling advance in the price of coal. The improvement was, however, of short duration, and before the end of the present quarter was out, the check was pronounced. During the last half of the quarter the full continued, and on the approach of March followed a falling-off in the demand for both household and ironmaking fuel. The system of unduly forcing up prices and purchasing on the part of the speculators, and the consequent relaxation in rates would result. The demand upon the American account fell off even more suddenly than it sprang up, and with it simultaneously was witnessed a slackening in the demand both for household and furnace coal. At the April quarterly meeting of the directors of the county, it was decided that the number of furnaces in blast was to be reduced, leaving the figures 20s. less than they were in the month of February. The number of furnaces in blast dwindled down to 60, and the output, which at the commencement of the year could scarcely have been less than 10,000 tons per week, was not more than 70,000 at the commencement of May. Throughout the summer the demand for household consumption was reduced, and the markets were overstocked by speculators, who were eager to sell, and who in numbers of cases sustained losses of 40 and 50 per cent. Unmarked bars of excellent quality were freely offered at £6 10s. and £6 15s., whilst pig was unsaleable at greatly reduced rates. The great and depressing reaction reached its worst point in July. Speculators having rid themselves of their bad bargains, and coupled with the diminution in the output, and cessation from activity on the part of many of the mills and forges, stocks had grown less, and a better starting-point arrived. August brought signs of improvement. Mills and forges were set running again, and prices slightly advanced, whilst the market became brisker and more active. Gradually and surely an improvement became apparent; orders came to hand more freely from Australia, India, and other of the foreign markets, and America has since also been a purchaser to a fair extent for all kinds of finished iron. Best marked bars grew firm at £8, and unmarked bars at £7 5s. The demand for mill plates, and nail rods good request at £10 10s. and £11 10s. per ton. The demand for the Australian and South American markets were in good request. During the closing quarter it may be said that in both the coal and iron trades a steady progressive market has existed, and which continues to look of a hopeful and healthy character, and therefore it may be expected the more lasting and certain.

SALE OF SHARES IN THE DERBY GAS COMPANY.—On Tuesday last, Messrs. Oliver, Newbold, and Oliver sold by auction, at Derby, 2000 shares in the Derby Gas Company, which realized the following prices:—Four £25 shares, entitled to a dividend of 10 per cent., £35 10s. per share; 20 £25 shares, 7 per cent. dividend, £35 15s. per share; 12 £12 10s. shares (£6 5s. paid), entitled to 7 per cent. dividend, £17 17s. 6d. per share; 12 £12 shares, £45 15s. per share. The total amount realized by the sale was £1160 10s.

THE PROPOSED PURCHASE OF THE CLAY CROSS WATER-WORKS BY THE LOCAL BOARD.—It may be remembered that a short time since (see ante, p. 779) the question of purchasing the Clay Cross Water-Works from the private Company supplying the district was under the consideration of the Local Board, with the result that an offer of £19,000 was made for the Government Board with reference to the granting by them of compulsory powers of purchase. The Board having replied that such powers could not be granted, a deputation was appointed to meet the Directors of the Company, and inquire whether the Shareholders would be willing to sell the works. The deputation recently had an interview with the Directors, who informed them that if they could

recommend the Local Board to offer the sum of £15,000, the Directors would advise the Shareholders to accept this sum for the works. Mr. Clark, the Chairman of the Directors, said the present was a very unfavourable time to purchase the works, and recommended delay. The matter came again before the Local Board at their last meeting, when Mr. Dickinson, one of the deputation, said he could not recommend the Board to offer the sum asked, and it was ultimately agreed to postpone the question for twelve months.

OPENING OF NEW WORKS OF THE EAST GRINSTEAD GAS AND WATER COMPANY.—On Tuesday last a numerous party assembled at the new works of the above Company, which have been in course of construction for the past two years, to celebrate their completion. After inspecting the buildings, plant, and machinery, which are of the usual character, and having been informed by Mr. C. H. Stenning, C.E., of the works at Easton, the party dined together at the Crown Hotel, under the presidency of Mr. W. V. K. Stenning, Chairman of the Company. The Rev. D. Y. Blakiston proposed "Success to the East Grinstead Gas and Water Company," and in doing so gave some particulars in connection with the formation of the Company, and the various difficulties which it had to encounter in connection with their operations, but said he was gratified at being able to state that now, thanks to Mr. Easton, they were in a position to supply water to any applicants at a reasonable price. The fact of a supply of good water being brought to the parish, he said, was a very great benefit to the parish, and a great relief to the parish, for which the inhabitants were indebted to the Gas and Water Company. They had been able to realize all their money—£14,000—which they wished, with the exception of a few shares, to be taken up by people in the place. At present the Company did not expect to carry out great works, but they would be glad to see the parish in a position to do so in this respect. Other toasts followed, and the proceedings terminated.

EXTENSION OF THE GAS-WORKS AT THE ROYAL ARSENAL, WOOLWICH.

There have just been completed some extensive additions and alterations to the works supplying the Royal Arsenal at Woolwich with gas. Included in the contract for the new plant, which comprised manufacturing plant, purifiers, steam pumps, &c., was a large holder. The work was in progress for some time, and the new apparatus was being erected, when the new apparatus was taken into use and the large holder filled with gas. So rapidly have these gas-works grown since their first establishment some years ago, owing to the great success which has attended them commercially, that whereas there were but two holders when the works were first erected, there are now five, and the same number of holders will be required in the same proportion. At the present time these works, which are the largest in the Government service, are making and supplying more than five times the quantity of gas they did a few years ago. It will thus be seen that the gas-works are a good example of the growth of gas supply, and to obtain for some time to come, there not being any prospect of the adoption of the electric light for general use, either for the great national workshops or other Government buildings, unless in some special case where other and more important considerations outweigh the matter of cost. The works were designed and constructed by Messrs. Samuel Cutler and Sons, of Millwall, from designs prepared by Mr. J. O. Hay, C.E., the Inspector of Machinery and Superintendent of Gas-Works to the War Department, under whose immediate supervision they were carried out. Mr. Hay, in conjunction with Mr. J. H. Wallace, the Manager, the whole has been brought to a successful termination.

INSTITUTION OF CIVIL ENGINEERS. The Annual general meeting of the Institution was held last Tuesday—Mr W. H. Barlow, F.R.S., the President, in the chair. A lengthy report by the Council, on the operations and finances of the Institution during the past year, was adopted; after which the President briefly addressed the meeting. The Scrutineers then reported that the previous year's accounts had been duly audited and found correct. Mr Barlow, by the President, to whom the thanks of the meeting were unanimously voted, the services of the Vice-Presidents and Council, and of the Auditors, were also publicly acknowledged. The Scrutineers then reported that the following gentlemen had been duly elected Honorary Members of the Institution by the Council for the ensuing year.—Mr James Abernethy, President; Sir W. G. Armstrong C.B., F.R.S.; Sir W. B. Bazalgette, C.B., Mr F. J. Bramwell, M.A., F.R.S.; Sir John Lubbock, F.R.S.; Mr R. G. Berkeley, Mr G. B. Bruce, Sir John Cooke, Mr E. Cowper, Mr J. H. Fowler, Mr T. H. Green, Mr Hartley, Mr H. Hayter, Dr W. Pole, F.R.S., Mr R. Rawlinson, C.B., Mr A. M. Rendel, Dr C. W. Siemens, F.R.S., Mr D. Stevenson, Sir W. Thomson, F.R.S., F.R.S.E., F.R.I.C., F.R.Met.Soc., F.R.S., F.R.S.E., and other Members of Council. This announcement being received with much applause, as follows:—Tuesday, Jan. 11, 1881, at 8 p.m.: Address by Mr Abernethy, President, and Monthly Ballot for Members. At the previous meeting of the Council, on Monday, Dec. 27, 1880, the Council had recently transferred from the Institution to the Institution of Mechanical Engineers, the names of Mr H. Tomlinson to the class of members, and of Mr J. H. Fowler to the class of ballot of the session resulted in the election of 41 Associate Members, among whom were Messrs. William Benjamin George Bennett, Borough Engineer, Southampton; John Henry Barker, Borough Surveyor of Bradford, Yorks.; Thomas Aldridge, Town Works Officer, Oxford; Sidney Smith, Borough Surveyor of Grantham; Septimus Pimms, Supt. Indst. C.E., Engineer of the Southend Gas-Works; John Henry Taylor, Town Surveyor, Hastings; Henry H. Worsley, Resident Engineer, Kapunda, Water-Works, South Australia.

THE WATER SUPPLY OF RICHMOND (SURREY).—On Friday, the 10th inst. Major Tulloch, one of the Local Government Board Inspectors, held an

inquiry relative to application by the Select Vestry of Richmond for sanction to borrow £18,000 for purposes connected with the water supply of the town. The Vestry Clerk (Mr. F. B. Senior) explained that the £18,000 comprised two separate applications—viz., £10,000 for a new well and £8,000 for the temporary supply. The latter was to be expended in providing the temporary supply; but although the Vestry had authorized the borrowing of a sum not exceeding £10,000, he was in a position to show that the works connected with the new well would not exceed £8000. Mr. Homersham, C.E., was then called, and, in reply to a question, stated that, although the new well would be subjected to cross-examination, with the object of showing that the sinking of a new well on the existing site, while it would involve a considerable additional outlay, would not secure the end so much desired by the inhabitants of Richmond—namely, the obtaining of a permanent supply of water, he was in a position to read the instructions forwarded to him, and stated that he was not consulted by the Water Supply Committee as to the choice of the most suitable site for the proposed well, but was merely asked to turn his attention to what was best to be done for the town in obtaining a permanent supply of water. In reply to a question he would probably answer the object intended. In reply to the Inspector, he stated that the water obtained would be very pure. Replying to the Vestry Clerk, Mr. Homersham said he had estimated the cost of the proposed works at £4500, which he had put down as a maximum. In reply to a question, he stated that Mr. Maxwell (one of the members of the Select Vestry) was asked by the Inspector if he had any alternative proposition to make to the one now submitted, and he suggested that the Vestry should sink a well in Petersham meadows. It was further stated that the water obtained from the new well would not be better than that obtained from the old well, the same quality as the present yield from the old well. Evidence was afterwards given by Mr. Feire, the Resident Engineer, as to the pumping machinery required for the new works. The second branch of the inquiry, as to the proposed temporary supply, was then taken up, and the proceedings terminated.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 5155.—TOY, S., Birmingham, "Improvements in meters for measuring water and other liquids." Dec. 10, 1880.
- 5156.—CHAMBERLAIN, A. P., Finsbury, London, "Improvements in the manufacture of gas for illuminating, heating, and other purposes." Dec. 10, 1880.
- 5198.—WISE, W. L., Westminster, "Improvements in carburetting apparatus for the manufacture or treatment of gas for lighting and heating purposes." A communication. Dec. 11, 1880.
- 5219.—FIDDES, A., Bristol, Gloucester, "Improvements in gas motor engines." Dec. 15, 1880.
- 5247.—MACDONALD, J., Queen Victoria Street, London, "Improved means of and apparatus for increasing the illuminating power of coal gas." Dec. 14, 1880.
- 5257.—CORRIET, J. L., Glasgow, "Improvements in the construction of regulators for governing or controlling the supply or pressure of illuminating gas." Dec. 15, 1880.
- 5260.—BRETT, W., and ABBEY, J. B., Huddersfield, Yorks., "Improvements in the method of and apparatus for coupling and uncoupling pipes to water and gas meters and similar purposes." Dec. 15, 1880.
- 5283.—MASON, J., Birmingham, "Improvements in engines or engines to be worked by steam, air, or gas." Dec. 21, 1880.
- 5371.—DENNIS, J. B., Paris, "Improvements in valves, cocks, or taps for regulating or controlling the flow of liquids, gases, or vapours." Dec. 23 1880.
- 5390.—PAULSON, R., Burdett Road, London, "Improvements in apparatus for utilising the unconsumed gases given off during combustion, prevention of smoke, and the economising of fuel for steam-boiler furnaces, and other furnaces and purposes." Dec. 23, 1880.
- 5401.—LAWR, E. G., Torquay, Devon, "Improvements in gas-governors." Dec. 23, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 9122.—FOULIS, W., Glasgow, "Improvements in gas-engines." June 15, 1880.
- 9293.—GRACE, G. C., Peekham, London, "Improvements in pressure governors or reducing valves for regulating the pressure of liquids, gas, and air." Aug. 12, 1880.
- 4011.—GREEN, N. G., New York, U.S.A., "Improvements in the method of obtaining an increased water supply for cities, towns, manufactories, and other places, and in apparatus for the same." A communication. Oct. 5, 1880.
- 4297.—CROSSLIE, F. W., Manchester, "Improvements in gas motor engines." Oct. 21, 1880.

PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100

4088.—TURNER, F. W., "Improvements in motors to be worked by gas and air." Dec. 11, 1873.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Dec. 22, 1880.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company	Notting Hill											
	Camden Town	17-2	16-6	16-9	16-8	14-7	15-7	0-1	0-0	0-0	None.	In excess.
	Dalston	18-4	16-8	17-3		14-4	10-1	19-8	0-4	0-0	0-1	"
	Bow	17-9	16-6	16-9	16-1	11-9	13-7	0-4	0-2	0-3	"	"
	Chelsea	17-2	16-7	16-9	15-1	14-1	14-6	0-4	0-0	0-2	"	"
	Kingsland Road	17-3	16-7	17-0	16-9	14-6	15-8	0-1	0-0	0-0	"	"
	Westminster (canal gas).	21-3	20-8	21-0	20-3	20-0	21-5	0-2	0-0	0-1	"	"
South Metropolitan Gas Company	Peckham	16-8	16-6	16-7	11-3	10-6	10-9	0-4	0-0	0-2	"	"
Commercial Gas Company	Old Ford	17-4	17-0	17-2	15-3	13-6	13-8	0-3	0-1	0-2	"	"
	St. George-in-the-East	17-5	16-8	17-2	9-8	5-3	7-2	0-3	0-0	0-1	"	"

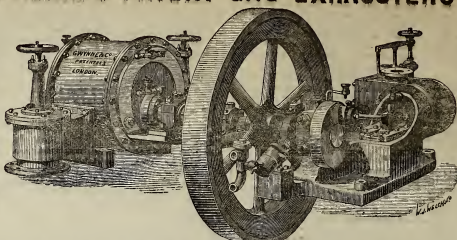
(Signed)

T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for canal gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL OF MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & CO.

Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is — "Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO.'S PATENT COMBINED EXHAUSTER AND ENGINE.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

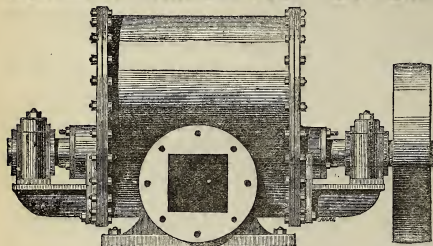
PLEASE ADDRESS IN FULL, **GWYNNE & CO.,** Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,

WITH OR WITHOUT

WROUGHT-IRON SPINDLES AND ENGINES COMBINED.



GEORGE WALLER & CO.,

MAKERS OF

ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

PHENIX ENGINEERING WORKS:

HOLLAND STREET, SOUTH WARK, S.E.

WANTED, Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, **MAGNUS OLSEN, Assoc.M.I.C.E., Gas-Works, STOKHOLM.**

WOLVERHAMPTON GAS COMPANY.
WANTED, a Salesman, to Take Charge of the Sale of Gasaliers, Gas-Fittings, and Gas Stoves.

Applications, stating age, previous experience, and salary expected, to be sent in, addressed to the Chairman, on or before Jan. 5, 1881.

TO GAS ENGINEERS AND MANAGERS.

WANTED, by the Georgetown (British Guiana) Gas Company, Limited, an **ENGINEER** and **MANAGER** for their Gas-Works, at Georgetown, Demerara.

Salary £300 per annum, with a bonus of £50 for every 1 per cent. per annum paid in dividend over 5 per cent. per annum on the ordinary share capital. The Company are at present paying 8 per cent. per annum on the preference, and 7 per cent. per annum on the ordinary share; £75 per annum will be allowed for house rent; coke and gas free; the Company also provides a horse and carriage; passage out and home paid for; half salary allowed during passage out and home, and full salary on arrival.

An agreement must be entered into for a period of five years, terminable, at the option of the Company, at the expiration of the first or third year. Form of agreement to be seen at the Office.

Security required to the extent of £500.

The selected candidate must be prepared to leave England not later than the 31st of March next, but will not take charge as Manager until July 25 next.

Applications with testimonials (copies only) to be forwarded to the Secretary of the Company, 30, Gracechurch Street, London, on or before Jan. 31, 1881.

By order,

ALFRED LASS, Secretary.

Offices, 30, Gracechurch Street, London,

Dec. 17, 1880.

TO GAS MANAGERS.

WANTED immediately, by the Town Commissioners of Newry, a competent **MANAGER** for their Gas-Works, at a salary of £150 per annum, with residence, coal, and gas.

Applications, with copies of testimonials, to be addressed to the Chairman of the Gas Committee.

JOHN KERRAGHAN, Secretary.

Newry, Dec. 17, 1880.

THE Town Commissioners of Brandon will receive **APPLICATIONS** from persons competent to discharge the duties of **MANAGER** and **FITTER** of their Gas-Works. Salary at the rate of £100 per annum, with residence, coal, and light.

Applications, accompanied with reference and testimonials, to be lodged with me, on or before Saturday, Jan. 1, 1881.

S. R. TETTERLIN, Clerk to the Commissioners.
Brandon, Dec. 9, 1880.

WANTED—The Advertiser, a Young Man, aged 30, married, is open for an Engagement as **MANAGER** and **SECRETARY** of a medium-sized Gas-Works, or **SUB-MANAGER** of a large Works. Has a thorough knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Gas-Works for 16 years. Highest testimonials and references.

Address No. 673, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Advertiser wishes strongly to Recommend a good Steady Man as **WORKING MANAGER** or **CARBONIZING FOREMAN** of a Gas-Works. He thoroughly understands the Manufacture and Distribution of Gas, also Mains, Services, and Interior Fittings, and smith's work. Would not object to a situation as Fitter.

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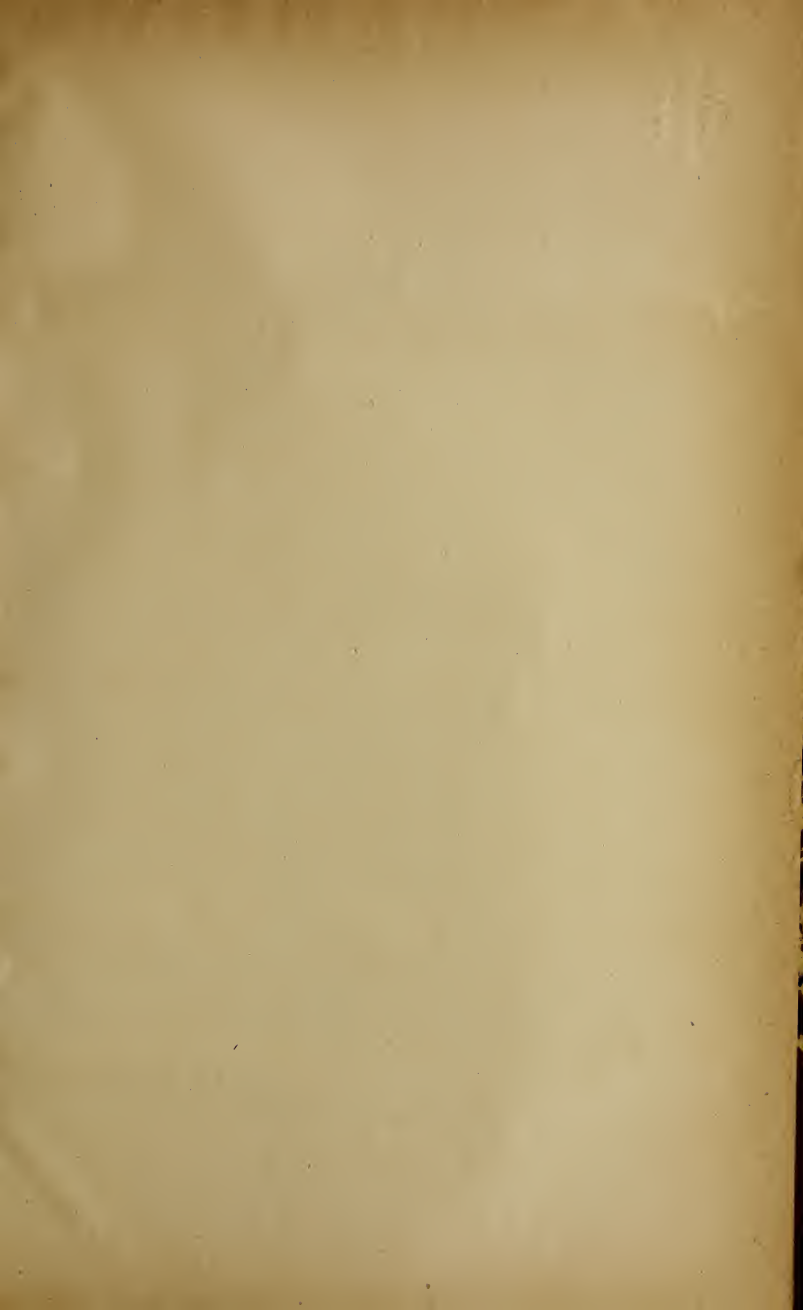
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